

**STORM WATER MONITORING WORK PLAN
(Revision No. 1)**

GE Energy - Energy Services
Portland Inspection & Repair Service (I&RS) Center
2727 NW 29th Avenue
Portland, Oregon

Submitted to:

Mr. Tom Gainer
Oregon Department of Environmental Quality
Northwest Region
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Submitted by:

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Mr. Tom Gainer
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Northwest Region
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201

Dear Mr. Gainer:

**Re: Storm Water Monitoring Work Plan - Revision No. 1
GE Energy - Energy Services
Portland Inspection & Repair Service Center
2727 NW 29th Avenue, Portland, Oregon**


AMEC Earth & Environmental, Inc. (AMEC) is pleased to submit this Revised Storm Water Monitoring Work Plan (Work Plan) for the GE Energy (GE) Inspection and Repair Service (I&RS) Center located at 2727 NW 29th Avenue in Portland, Oregon (Site). The Work Plan has been revised to address the recent decision to change the sampling protocol for the Site, as well as address comments received from the Oregon Department of Environmental Quality (DEQ) in a letter dated June 28, 2006. The Work Plan provides storm water sampling objectives and standard operating procedures to implement the proposed storm water monitoring program at the Site. The sampling program described in this Work Plan incorporates recent modifications made to the Site, following implementation of several best management practices (BMPs) at the Site.

The data obtained from the proposed Work Plan sampling activities will be evaluated in an effort to satisfy DEQ requests for additional information on the effectiveness of the source control measures implemented to date at the I&RS Center. The Work Plan has been prepared in accordance with the DEQ letter dated March 30, 2006, the Portland Harbor Joint Source Control Strategy document (DEQ and U.S. Environmental Protection Agency, 2005), and on-going discussions with DEQ. GE continues to conduct all activities cooperatively and in compliance with any and all DEQ requests.

We will begin to collect storm water samples at the Site following approval of this Work Plan. Please contact Tom Antonoff of GE (518-385-9931) or the undersigned (503-639-3400) to discuss any questions or comments you may have.

Sincerely,

AMEC Earth & Environmental, Inc.



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Geologist



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Attachments

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- Amy Murakami, GE Energy - Portland, Oregon
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1.0 INTRODUCTION

On behalf of GE Energy (GE), AMEC Earth & Environmental, Inc. (AMEC) has prepared this Revised Storm Water Monitoring Work Plan (Work Plan) to describe the proposed storm water monitoring activities to be conducted at the GE Inspection and Repair Service (I&RS) Center (Site) located at 2727 NW 29th Avenue in Portland, Oregon (Figure 1). The Work Plan has been prepared in response to the March 30, 2006 Oregon Department of Environmental Quality (DEQ) letter requesting storm water monitoring at the Site (DEQ, 2006) as well as to address comments received from the DEQ in a letter dated June 28, 2006. The proposed storm water sampling activities were compiled based on the framework for storm water sampling protocol provided in the Portland Harbor Joint Source Control Strategy (JSCS) document (DEQ and U.S. Environmental Protection Agency [EPA], 2005), and discussions with DEQ in September and October 2006.

1.1 Work Plan Objectives

The main objective of the Work Plan is to provide the field protocol to collect representative and reproducible data that can be used to further characterize the storm water discharge (both liquid and solid fractions) from the Site.

1.2 Work Plan Organization

The activities necessary to implement the proposed storm water monitoring program are described in this Work Plan, including procedures for field sampling, quality assurance, waste handling, and final reporting phases. Additional details, related specifically to the field sampling phase, are included in the Standard Operating Procedures (SOPs) included as Appendix A.

References for specific phases of the work are made to the site-specific Health and Safety Plan, available under separate cover, and project-specific quality assurance protocol, described in Section 4.0 below and Appendix B.

2.0 BACKGROUND

This section provides a description of the Site and information related to best management practices (BMPs) that have been implemented at the Site.

2.1 Site Description

The approximately 3.06-acre Site is located at 2727 NW 29th Avenue in Portland, Oregon (Figure 1). The Site is identified as Tax Lot 1N1E29AC 1200, in the northeast

quarter of Section 29, Township 1 North, Range 1 East, relative to the Willamette Meridian. The elevation of the Site ranges between 32 and 36 feet above mean sea level (MSL), and the land surface across the Site is relatively flat (Figure 2). The summit of the West Hills (elevation approximately 1,200 feet above MSL) is located approximately 2 miles west-southwest of the Site. The nearest surface water body is the Willamette River, located approximately 3,000 feet northwest of the Site (Figure 3). The Site is not within the 100-year floodplain of the Willamette River.

The Site currently is operated as an electrical equipment service and repair facility and warehouse. The Site is occupied by the following three structures:

1. An approximate 60,000 square foot (sf) slab-on-grade main building;
2. An approximate 100 sf slab-on-grade paint storage shed; and
3. An approximate 400 sf slab-on-grade covered storage.

Areas beyond the Site structures consist of the following:

- The approximate 37,750 sf asphalted North Yard parking lot and equipment storage area. Perimeter fencing and curbing exists around the North Yard that restricts access to the area.
- The approximate 11,400 sf asphalted south parking lot.
- The approximate 18,500 sf landscaped area located along the eastern edge of the property.

The Site has two storm water sewer systems, one in the North Yard that includes runoff from the main building roof drains, and one in the south parking lot (Figure 2). The North Yard storm sewer system includes four catch basins (CB1R, CB2R, CB3R, and CB8) and the main building roof drains. The discharge point for the North Yard storm sewer system is through manhole MH2 located in the northwestern corner of the North Yard (Figure 2). The south parking lot storm water sewer consists of one filtered catch basin (CB9). The south parking lot storm sewer combines with the Site's sanitary sewer prior to discharging to the public combined sewer located in NW Industrial Street. The discharge point for the south parking lot combined storm and sanitary sewers is manhole MH3 located near the southeastern corner of the property (Figure 2).

2.2 Source Control Evaluation of the I&RS Center

In October 2003, DEQ issued a letter to GE requesting a Preliminary Assessment/Site Inspection (PA/SI) at the Site. DEQ is currently evaluating the potential sources of

polychlorinated biphenyls (PCBs) and other constituents of concern to Willamette River sediments. Since receipt of the October 29, 2003 correspondence from the DEQ, GE has entered into the DEQ Voluntary Cleanup Program (VCP) as documented by AMEC submittal of a letter agreement on January 14, 2004. The DEQ has assigned the Site an Environmental Cleanup Site Information (ECSI) database site identification number of 4003. Since that time, GE has worked cooperatively with DEQ and the City of Portland Bureau of Environmental Services (BES) to conduct the source control evaluation (SCE) activities that are documented in the *Source Control Evaluation and Implementation Report*, dated February 2006 (AMEC, 2006) and the *2006 Source Control Evaluation and Implementation Addendum Report* (AMEC, 2006a).

Several source control remedies and BMPs have been implemented to reduce the potential for constituents of interest (COIs) to enter storm water at the Site. Source control activities that have been recently implemented, or are about to be implemented, and have not yet been reported to DEQ include the following:

- Existing concrete catch basins CB1, CB2, and CB3 have been replaced with new steel catch basins CB1R, CB2R, and CB3R, respectively;
- Trench drain CB6 and catch basin CB7 have been abandoned;
- One new catch basin, CB8 was installed;
- In-line filtration equipment, specifically a 13-cartridge StormFilter® vault, SF1, and a 2-cartridge StormFilter® catch basin, CB9, were installed in the North Yard and in the south parking lot, respectively;
- The existing main building roof drain system was replaced and the eastern most roof drain conveyance line was rerouted to the North Yard storm sewer;
- Sections of storm sewer were removed and replaced with new piping;
- Sections of the North Yard storm sewer that had not been replaced within the last two years were slip lined;
- Concrete curbing was installed along the perimeter of the North Yard and in sections of the south parking lot;
- An overlay of asphalt pavement will be placed across the existing pavement in the North Yard and south parking lot, and rollover asphalt curbing will be placed at the driveway of the North Yard and the south parking lot; and
- An industrial cleaning of the main building exterior will take place following installation of the asphalt pavement.

3.0 FIELD SAMPLING PROCEDURES

Detailed descriptions of appropriate field sampling procedures for storm water and solid sampling are specified and documented in the SOPs found in Appendix A. Standardized protocols are defined so that field data are collected and reported in a standard manner regardless of sample location or person collecting/recording the data. The following field activities will be performed as part of the sampling activities at the Site.

3.1 Sampling Event Criteria and Frequency

A summary of the proposed storm water and catch basin solid sampling plan is presented in Table 1.

3.1.1 Storm Water Sampling

A total of four storm water sampling events are planned to be performed at the Site as a part of this program. Storm water sampling will be conducted during rain events that meet the JSCS storm event criteria (DEQ/EPA, 2005) to ensure that the volume of storm water discharge will be sufficient for sampling, will be representative of the Site's discharge, and will be consistent with sampling performed at other upland sites. The specific JSCS criteria that will be met include:

1. Antecedent dry period of at least 24 hours (as defined by <0.1-inch of precipitation over the previous 24 hours);
2. Minimum predicted rainfall volume of >0.2-inch per storm event; and
3. Expected duration of storm event of at least 3 hours.

The field staff will verify the duration of the antecedent dry period prior to the sampling event using the on-Site rain gauge. In addition, the National Weather Service forecast will be monitored as a tool to predict if the rain event is anticipated to last at least 3 hours. After the start of the rain event, the time storm water discharge begins on-Site from each of the two sampling locations will be recorded. Sampling will commence using automated sampling devices within 15 minutes from the time discharge begins. Each of the sample locations will be equipped with a mechanical metering device to obtain continuous flow rate measurements.

3.1.2 Catch Basin Solid Sampling

Catch basin sumps are designed to contain debris and sediments and allow for the settling of sediment to occur. When catch basin sumps fill with solids, sediment in the

sump can become suspended and can potentially lead to unwanted discharges of sediment to the storm water sewer system. Periodic catch basin monitoring will provide additional information on solid accumulation and effectiveness of the BMPs employed at the Site.

Catch basin solid sampling will be performed one time as a part of this program to confirm the COI list for the Site. The catch basin solid sampling event will be conducted following sufficient volume accumulation within each of the catch basins.

3.2 Monitoring and Sampling Locations

Catch basin and manhole locations are included as part of the sampling plan to collect a variety of qualitative and quantitative data. Catch basin monitoring will be performed during sampling events to record field observations and identify the condition of each on-Site catch basin. In addition, accumulation of solids will be monitored during each sampling event within North Yard catch basins CB1R, CB2R, CB3R and CB8, and the sump for filtered catch basin CB9 located in the south parking lot.

Storm water sampling will be conducted to obtain representative samples of the Site's storm water discharges to the public sewers. Site storm water will be sampled from manhole MH2 located in the North Yard and the new sampling vault SV1 installed in the south parking lot. The manhole MH2 sample will be representative of the storm water generated from the main building roof and North Yard. The sampling vault SV1 sample will be representative of the storm water runoff from the south parking lot. Sample locations within the pipe and sample equipment locations within MH2 and SV1 are indicated in Figure 4 and Figure 5.

3.3 Field Visual Quality and Indicator Measurement Collection

Field observations and indicator parameters, identified below and in Table 2, will provide specific information necessary to evaluate the results of the storm water sampling events.

3.3.1 Field Visual Quality Indicators

Field visual quality indicator data will be collected from the on-Site catch basin monitoring locations (CB1R, CB2R, CB3R, CB8, and CB9). Visual quality indicators will be documented in Field Form A, in SOP-1 (Appendix A). Field personnel will document the color and odor, if any, of the storm water present in the catch basin and also will note observations of the presence of foam, sheen, and/or debris. In addition, the field crew will make observations regarding the presence or absence of storm water flow, and the condition of BMPs (catch basin filters, biobags, etc.), if any, at each

sampling location, during each of the sampling events. Because catch basin sumps are often full of water, field personnel will use a measuring stick or equivalent to monitor the catch basin for the amount of sediment in the sump.

Visual observations, including color, odor, debris, and sheen also will be made for each sample aliquot collected from manhole MH2, and sampling vault SV1, prior to preparing the composite sample.

3.3.2 Field Indicator Measurements

The indicator parameter measurements automatically collected in the field will include estimated storm water rainfall magnitude and discharge flow rates. Rainfall measurements will be continuously collected using an automated rain gauge located on the western edge of the main warehouse building roof. The rainfall measurements will be evaluated to ensure that storm water runoff will be sufficient for sampling, will be representative of runoff, and will be consistent with JSCS sampling criteria. The discharge flow rates will continuously be recorded using automated in-line bubbler flow meters located within the discharge conveyance lines in manhole MH2 and sampling vault SV1. The flow meter readings will provide accurate hydrograph data for the Site, as well as provide relative changes in the storm water volume discharged from the Site. Both the rainfall and flow rate data will be electronically downloaded remotely.

The storm water field parameters will be measured for each of the two composite samples collected from manhole MH2 and sampling vault SV1 including temperature, pH, conductivity, and turbidity. All field parameters will be collected in accordance with the standard procedures described in SOP-1 (Standard Operating Procedure for Storm Water Sampling) and SOP-2 (Field Parameter Measurement for Storm Water Discharge Sampling Procedure) included in Appendix A. Details of the procedures and documentation requirements are outlined in each of the SOPs.

3.4 Sample Collection

Total and dissolved storm water and catch basin solid sampling will be conducted at the Site according to the procedures described below.

3.4.1 Storm Water Sampling

Composite storm water samples will be collected during four sampling events. Individual sample aliquots will be collected using automated sampling devices at each of the two proposed sampling locations (manhole MH2 and sampling vault SV1). The samples will be collected through clean tubing into individual unpreserved glass bottles. During the first 3 hours of the storm event, one 950 milliliter (ml) sample will

be collected every 15 minutes. Following the initial 3 hours of the storm, a 350 ml (minimum) sample will be collected every hour for the remainder of the storm event, up to a maximum storm length of 24 hours. Following collection, one flow-weighted composite sample will be prepared for each sampling location by manually combining the individual sample aliquots in proportion to the change in the flow volume since the time the previous sample was taken. The procedure for preparing the flow-weighted composite sample is described in SOP-1 (Standard Operating Procedure for Storm Water Sampling), included in Appendix A. The collection of individual aliquots also will allow discrete sample analysis, if desired, based on flow measurements, visual observations, or previous sampling data.

In general, dedicated sampling equipment will be used. Specifically for the automated sampler turn table, the sampling equipment will be decontaminated following sample collection at each location, according to the decontamination procedures specified in SOP-3 (Standard Operating Procedure for Decontamination), included in Appendix A. Waste generated during the sampling procedure will be handled according to the waste handling procedures described in Section 5.0 below.

A high volume of storm water will be collected at each location for two reasons: (1) to meet the proposed screening level values described in Section 6.2 below; and, (2) to conduct total and dissolved analysis, as indicated below for select constituent groups. Individual aliquots will be collected, and the composite will be prepared, according to a constant time with each individual volume proportional to the flow rate over that time. A portion of the composite sample will be filtered, using a 0.1 micron polyvinylidene fluoride (PVDF) membrane filter, and submitted to the contract laboratories following project-specific protocols described in Section 3.5 below. A 0.1 micron PVDF membrane filter is required to assure that colloidal solids present in the sample are removed, providing an accurate representation of COI concentrations in the dissolved phase. Samples will be contained in the appropriate sampling containers for storm water media (Table 2).

At a minimum, one 8-liter flow-weighted composite sample will be prepared from the individual sample aliquots at each of the proposed sample locations. Four liters of the 8-liter composite sample will be filtered using a 0.1 micron PVDF membrane filter for each of the two sample locations. The total and filtered composite samples will be contained in the appropriate preserved sample containers and will be shipped to a GE approved laboratory for preparation and analysis of the following Site-specific COIs:

- Total and dissolved priority pollutant metals by EPA 6000/7000 series;
- Total and dissolved polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270 Select Ion Mode (SIM);

- Total and dissolved PCBs by EPA Method 8082;
- Total and dissolved diesel and heavy oil range organics by NWTPH-Dx;
- Total suspended solids (TSS) by EPA 160.4;
- Total and dissolved organic carbon by EPA 415.1; and
- Particle size distribution (PSD) by scanning electron microscope (SEM).

Additional details for laboratory sample preparation requirements are listed in Appendix B, Table B-1.

Total and dissolved analysis may provide additional information for potential constituent phases. For evaluation purposes, the difference between the total and dissolved metals concentration will be considered the total solid fraction of constituents present in the storm water sample.

Strict adherence with the sample volume quantities included in Table 2 will allow the laboratory to meet project-specific reporting limits.

3.4.2 Catch Basin Solid Sampling

Catch basin solids will be sampled in accordance with the Guidance for Sampling of Catch Basin Solids, prepared for the City of Portland in July 2003, included as Appendix A, SOP-4.

Individual catch basin solid samples will be collected using non-disposable sampling equipment. The sampling equipment will be decontaminated following sample collection at each location, according to the appropriate decontamination procedures as specified in SOP-3 (Standard Operating Procedure for Decontamination), included in Appendix A. Following sampling activities, waste generated during the sampling procedure will be handled according to the waste handling procedures described in Section 5.0 below.

At a minimum, and assuming the catch basin contains a sufficient amount of sediment, two laboratory prepared 9-ounce glass jars with Teflon-lined lids will be filled with solids that have accumulated within each catch basin. Samples will be properly labeled and placed into an iced cooler for shipment to a GE approved laboratory for preparation and analysis of the following Site specific COIs:

- Total priority pollutant metals by EPA 6000/7000 series;
- Total PAHs and phthalates by EPA Method 8270 SIM;
- Total and dissolved PCBs by EPA Method 8082;

- Total and dissolved diesel and heavy oil range organics by NWTPH-Dx; and
- PSD by SEM.

Additional details for laboratory sample preparation requirements are listed in Appendix B, Table B-1. Strict adherence with the sample volume quantities included in Table 2 will allow the laboratory to meet project-specific reporting limits.

3.5 Sample Designation and Handling

Sample handling and designation procedures are included to provide sufficient project-specific quality assurance (QA) and quality control (QC) measures. Project-specific QA/QC requirements and procedures described in the following sections include:

- QC sample collection requirements;
- Sample container requirements and preservation;
- Sample documentation and handling; and
- Chain-of-custody documentation.

3.5.1 QC Sample Collection Requirements

A variety of field and laboratory QC samples are required in order to assess performance of the project team in collection and analysis of the storm water and catch basin solid samples.

A blank sample will be collected to serve as an indicator of the cleanliness of the sampling procedure. Collection of the sample blank will consist of passing deionized water or distilled deionized water through the sample tubing after the storm water sample collection is complete. The blank sample will be collected in the appropriate preserved sample containers.

Laboratory QC samples are field samples that are designated for laboratory QC procedures such as laboratory duplicate analysis or matrix spike analysis. The laboratory will analyze the QC samples in accordance with the requirements indicated in Appendix B, Table B-2.

3.5.2 Sample Containers

The contract laboratory will provide pre-cleaned, certified containers as appropriate for the required analysis. Sample container quality protocols will be strictly enforced and assured by the laboratory. The laboratory will retain certificates of analysis from each lot of containers for a period of at least 5 years. Containers supplied by the laboratory

will be free of chemical preservative. Sample containers will be kept closed until used. Four liters of the 8-liter composite sample will be filtered through a 0.1 micron PVDF membrane filter. Following filtration, each of the samples will be distributed into preserved sample containers. The sample containers, preservation, and holding time requirements for this project are described in Table 2.

3.5.3 Sample Preservation and Holding Times

The use of proper chemical and thermal preservation is critical to maintain the validity of project samples. Field personnel will verify that the correct laboratory-supplied containers are filled for each of the total and the dissolved sample and labeled with the corresponding intended analysis in accordance with Table 2, following sample composition filtration for the dissolved portion of the sample.

Sample bottles will be placed in a cooler with blue ice or double-bagged wet ice. The target temperature for the cooler is 4° Celsius (C) or less. Samples will be transported under chain-of-custody protocol to the contract laboratory as soon as possible after compositing, filtration, and preservation. A temperature blank, provided by the laboratory with the sample bottles, will be included in each cooler so the laboratory can document sample temperature upon receipt.

3.5.4 Sample Storage, Packaging, and Transport

Proper sample handling procedures will be followed so sample quality is not compromised after the collection of the sample and prior to submitting the sample to the laboratory. Each sample will be handled according to the protocol specific to that media.

Sample Storage

Collected samples will remain in the possession of a designated field representative at all times until custody is relinquished to the laboratory (in person or through shipment), or until the samples are placed in a secure storage location.

Sample Packaging

Samples will be transported in the same coolers used for sample storage. Samples will be accompanied by a completed chain-of-custody form, sealed in a Ziploc® bag to prevent damage to the document, and taped to the top of the cooler. Individual glass sample containers will be wrapped in bubble wrap bags or placed in foam packaging. Plastic sample containers will be placed in Ziploc® bags, but not bubble wrap.

Sample Transport

Samples designated for analysis at out-of-area laboratories will be repackaged (as necessary) for shipping. Bubble wrap and foam will be used to help prevent sample breakage during shipping. Samples will be packed into coolers with ice and labeled appropriately for shipping. Common carriers may be used for shipping. A chain-of-custody form will accompany each cooler during shipment.

3.6 Documentation

Verifiable sample custody is of primary importance during field and laboratory procedures. Such practices ensure samples have been properly acquired, preserved, and identified. This information will be collected in a variety of formats, specific to the function they perform in the sampling procedure (i.e., field logbooks, sampling field forms, sample labels, chain-of-custody forms, etc.). Sampling records create a complete record of field procedures, including circumstances of collection and integrity of the samples. This will also allow for detailed tracking of each sample from collection through transport and laboratory analysis. The following information outlines specific procedures that will be implemented during storm water sampling events.

3.6.1 Field Logbook

Field activities will be documented in a field logbook. The first entry at the beginning of each day will include the date and time, project number, names of field personnel on-Site (including subcontractors and the company for which they work), weather conditions, and the purpose of the field work. Each subsequent page will be started with the project number and the date.

Information included in the field logbooks will include the following items:

- Field observations relevant to the sampling event, including weather (wind direction and approximate speed, air temperature, sky cover, etc.), Site conditions, and events that may have occurred prior to sampling which may influence the integrity or the representative nature of the sample;
- Observations of Site activities not covered under regular activities, including presence of persons on-Site not related to the sampling activities, and actions by those people affecting work performance;
- Sketches of relevant information;
- Information relevant to a change in scope or change in Work Plan procedure, with documentation of subsequent approval;
- Type and/or level of health and safety equipment used; and

- References to information on Field Form A.

Information compiled in the field logbook will be written legibly in language that is clear and concise, without interpretation. Additionally, a summary of the activities conducted during each sampling event will be summarized on a daily field report form.

3.6.2 Field Sampling Form

A separate and complete storm water sampling form, Field Form A, within SOP-1, will be completed for each storm water sampling event. Information collected during sample handling and preparation will be marked on the form, in addition to notes taken in the field notebook.

Information may include:

- Date and time of sampling removal from the samplers, results of catch basin field observations (i.e., sheen, odor, etc.);
- Weather conditions;
- Rainfall event data;
- Sample composite data;
- Results of indicator parameter measurements (i.e., temperature, conductivity, etc.);
- Sample filtration techniques and sample preservation;
- Sample analyses requested;
- Information relevant to quality control (i.e., sampling discrepancies or difficulties; unexpected conditions or abnormal compositing procedures);
- Waste disposal method; and
- Decontamination method.

Completing each field on the form will help ensure that pertinent information is documented during the sampling event.

3.6.3 Chain-of-Custody Procedures

The chain-of-custody is an integral component of the sampling process as it stands as a permanent record of sample holding and shipment. Sample custody is documented from collection through transport, analysis, and reporting.

Samples will remain in the custody of field personnel or appropriate staff until receipt by the laboratory or relinquished to the shipper. The corresponding chain-of-custody form is in plain view at all times, in physical possession, or in a locked location where

no tampering will occur. The chain-of-custody form will be crosschecked for errors and signed.

Coolers with their respective chain-of-custody form(s) will be checked into the laboratory by a laboratory representative, and the chain-of-custody form will be relinquished to the laboratory by signing and dating the custody form appropriately. The field representative or staff member will retain one copy of the signed chain-of-custody form for the project files. The laboratory representative will verify cooler temperature, sample designation, and other relevant sample conditions. The original chain-of-custody form or a photocopy will be returned to the project manager with the analytical results to go into the project files.

3.7 Decontamination

Used non-disposable equipment that may come into contact with storm water will be decontaminated between each use. Decontamination procedures will help to eliminate cross-contamination between samples, a situation that leads to analytical results that may misrepresent the actual conditions. Equipment will be decontaminated according to the decontamination procedures provided in SOP-3 in Appendix A.

4.0 QUALITY ASSURANCE PROJECT PLAN

The primary purpose of the quality assurance project plan (QAPP) is production of chemical analysis data of known and sufficient quality to support the project-level Work Plan data quality objectives (DQOs), as described in Section 1.1 above. Project-specific Data Quality Indicators (DQIs) and associated method quality objectives are presented in Appendix B Table B-1 through Table B-5.

The data quality indicators (DQIs) discussed in the following section of this document will be used to: control data quality; laboratory compliance with DQI goals; analytical methodology requirements; and good laboratory practice will be assessed during the data verification and validation procedure.

4.1 Measurement Performance Objectives

The measures of data quality are summarized below and specifically identified in Appendix B, Table B-3.

4.1.1 Precision

A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions expressed generally in terms of

the standard deviation. The precision of a set of results is usually expressed as the fraction (percent) of the standard deviation relative to the mean (%RSD). Precision is measured by laboratory duplicate analyses. The precision data quality objective is established by the analytical method.

4.1.2 Accuracy

Accuracy is a measure of the proximity of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations. The EPA recommends using the terms "precision" and "bias", rather than "accuracy," to convey the information usually associated with accuracy. The accuracy of an analytical procedure is measured by surrogate compound and matrix spike sample analyses. The accuracy data quality objective is established by the analytical method.

4.1.3 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether in-situ and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied. Evaluating reported results with respect to those that might be measured in the field can assess this data quality objective. Moisture content can significantly affect this parameter.

4.1.4 Comparability

Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent in regard to the measurement of a specific variable or groups of variables. Comparability will be evaluated based on inter-laboratory duplicate samples.

4.1.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that should have been collected (i.e., measurements that were planned). A 95 percent data quality objective is proposed for the sampling described in this Work Plan.

4.2 Non-Detected Results

The results that are reported for each targeted analyte or compound will be presented as positive results or non-detected values. The values associated with non-detected results represent quantitation limits for that compound in that sample. The project-specific quantitation limits are provided in detail in Appendix B, Table B-4, and Table B-5 or storm water and catch basin solids, respectively, in terms of the laboratory method detection limit (MDL), reporting limit (RL), and quantitation limit (QL).

4.2.1 Method Detection Limit

The MDL is a measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte. Alternatively, this is the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. MDLs are analyte- and matrix-specific and laboratory-dependent.

4.2.2 Reporting Limit

The RL is the lowest limit that can be reliably reported in a sample. This parameter is sometimes equated to the QL. However, the RL can be less than the QL for some detections if instrument and sample conditions permit. Positive results reported at concentrations above the RL, but less than the QL are considered estimated.

4.2.3 Quantitation Limit

The QL is typically determined for an analysis by the lowest concentration of the calibration standard that is used and represents the lowest reliable detection that is accurately quantified. The QL can be affected by sample conditions such as moisture content or matrix interference. The QL can also be affected by analytical affects such as dilutions that may be needed to bring the quantified levels within the established calibration range.

The RL data quality objective is sample QLs that are no greater than the regulatory limit for the respective chemical or compound of concern.

5.0 WASTE DISPOSAL AND HANDLING PROCEDURES

Investigation derived waste (IDW) generated during conduct of the field investigations covered by this Work Plan may include decontamination water, personal protective equipment (PPE), and miscellaneous solid waste generated from sample collection

activities, as discussed in more detail below. All IDW will be characterized and properly managed for off-Site disposal. The following waste handling procedures will be used during implementation of this Work Plan.

- Containers of IDW generated during the investigation will be labeled and dated with information appropriate for accurate tracking and identification of the containers and their contents. IDW containers will be labeled with a “Pending Analysis” sticker until the results of analytical testing are available.
- Decontamination fluids, personal protective equipment, and disposable sampling equipment will be stored in appropriate containers staged at secure on-Site locations pending characterization and proper off-Site disposal arrangements.
- Non-hazardous wastes that may be generated during field sampling activities, including paper, plastic bags, and other miscellaneous types of debris, will be contained in plastic refuse sacks for disposal in approved waste receptacles on-Site.
- Final waste determinations will be based on knowledge of where and how the waste was generated and analytical results from the sampling locations collected. Wherever possible, testing results from analytical samples collected as part of the sampling program will be used to make waste determinations.
- Following waste characterization, the waste will be transported to an off-Site treatment, storage, and disposal facility (TSDF) for treatment, as necessary, and for final disposition of the waste according to applicable state and federal laws.

6.0 PROJECT REPORTING

6.1 Data Validation Review

The data that are reported for this project will be reviewed prior to reporting. The data validation will consist of an evaluation of sample collection, custody, analysis, and reporting to identify any quality control deficiencies. Data collected will either be used as reported, qualified as estimated, or rejected for its intended use.

The field forms will be reviewed for completeness and correctness. Analytical data validation will comprise the bulk of the data validation effort. The project laboratory officer or designee will evaluate the quality of the work based on this document and an established set of laboratory guidelines to ensure the following:

- Sample preparation information is correct and complete;
- Analysis information is correct and complete;

- Appropriate procedures have been followed, specifically with adherence to holding times;
- Analytical results are correct and complete;
- Laboratory QC check results for absence of blank contamination, initial and continuing calibrations, surrogate compound recoveries within limits, allowable matrix spike/duplicate recoveries, accurate internal control standard recoveries, and adequate instrumental performance, are within appropriate QC limits (Appendix B, Tables B-2 and B-3);
- Special sample preparation for total and dissolved storm water analysis and analytical requirements have been met;
- Documentation is complete (observed anomalies in the preparation and analysis have been documented; holding times are documented); and
- Laboratory qualifiers have been assigned to each sample with data usability limitations.

Final review of the reported data will be performed by AMEC chemists, and will include an examination of the data in terms of the qualitative data quality objectives. The data may be qualified based on significant concerns related to representativeness, comparability, and completeness. Each will be discussed, as appropriate, in terms of the deficiencies and associated project impacts. The results of the data validation review will be summarized within the summary report for each sampling event.

For purposes of this program, data validation activities will include a review of analytical constituent identification and quantification. This review will be performed by AMEC chemists with experience in analysis of environmental samples for PAHs, PCBs, petroleum hydrocarbons and metals as well as review and validation of like data, and will involve review of raw data from the individual analyses, including comparison of sample chromatograms to chromatograms of authentic reference standards for each constituent result obtained from the analytical laboratory.

6.2 Sampling Report

A summary report will be prepared and submitted, following each of the sampling events. The summary report will include the following, at a minimum:

- Consistency in meeting the specified sampling criteria, including hourly and total rain gauge data, antecedent dry period documentation, and target storm criteria evaluation, described in Section 3.1 above;

- Pertinent field documentation, including field observations and sample handling procedures, described in Section 3.6 above;
- Analytical results of the storm water sampling event, following data validation review, as described in Section 6.1 above;
- Data validation results; and
- Analytical tables.

6.3 Screening Level Values

Analytical results for the liquid and solid fraction analyses will be referenced against the screening level values (SLVs), presented in Table 3, for those constituents for which the listed value can practicably be achieved. The SLVs presented in Table 3 were obtained from Table 3-1 of the JSCS (DEQ /USEPA, 2005).

The SLVs that are listed for a number of chemicals in Table 3-1 of the JSCS (DEQ /USEPA, 2005) represent a number of concentration values that are based on use of exposure assumptions, toxicity values, and data interpretations from EPA's and DEQ's previous analyses and assessments. The use of these SLVs, however, does not reflect GE's concurrence with those assumptions, values, and interpretations. To the contrary, GE believes that many of those assumptions, values, and interpretations have the potential to overstate exposures and risks to human and ecological receptors in Portland Harbor, and GE preserves that position.

Specifically, for the health-based values, the SLVs were derived through back-calculations relying upon conservative exposure assumptions and toxicity values, and they include values reflecting excess cancer risk levels or non-cancer impacts using those inputs. As stated above, GE does not agree with many of the exposure assumptions, toxicity values, and other interpretations and analyses used in the derivation of the SLVs. To the contrary, GE believes that many of the exposure assumptions, particularly when used in combination, are not supported by Site conditions or use by human receptors, and therefore may substantially overestimate human exposure in the Portland Harbor area. In addition, the animal-based toxicity values, particularly for PCBs, overstate the carcinogenic potential and non-carcinogenic impacts in humans¹.

¹ It should be noted that, for the human health-based values for PCBs, JSCS (2005) has used toxicity values derived from animal studies. GE continues to believe that the weight of evidence from human epidemiological studies demonstrates that: a) there is little credible evidence that PCBs have caused any type of cancer in highly exposed occupational cohorts and virtually no evidence that PCBs could cause cancer in humans at environmental exposure levels; and b) with the possible exception of dermal and

For the ecologically based values, the SLVs were derived through back-calculations relying upon modeled exposures and effects as well as other non-site-specific information. In particular, the use of conservative literature-based toxicity reference values (TRVs) introduces a substantial amount of uncertainty into the assessment. As with the human health-based values, GE believes that many of the interpretations, analyses, assumptions, and toxicity values used in the derivation of ecologically based SLVs are not supported by the data and likely overestimate exposures and risks to ecological receptors in the Portland Harbor area.

GE has elected to use the reported SLVs for current comparison and screening purposes only, and does not consider the SLVs applicable action levels at an upland site such as the I&RS Center. The exceedance of a SLV does not indicate that corrective action will be required.

ocular effects in highly PCB-exposed workers, there is no credible evidence of a causal relationship between PCB exposure and adverse non-cancer effects in humans.

REFERENCES

AMEC Earth & Environmental, Inc. (AMEC), 2006. Source Control Evaluation and Implementation Report. Prepared by AMEC Earth & Environmental, Inc. Prepared for GE Energy – Energy Services. Submitted to Tom Gainer, Oregon Department of Environmental Quality Northwest Region. February 2006.

AMEC Earth & Environmental, Inc. (AMEC), 2006a, Source Control Evaluation and Implementation Addendum Report . Prepared for GE Energy – Energy Services. Submitted to Tom Gainer, Oregon Department of Environmental Quality Northwest Region. October 2006.

Oregon Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (USEPA), 2005. Final Portland Harbor Joint Source Control Strategy.

DEQ, 2006. Letter to Tom Antonoff, General Electric Power Systems regarding Storm Water Monitoring, Portland Inspection & Repair Service Center, 2727 NW 29th Ave., Portland, Oregon ECSI #4003. March 30, 2006.

Washington State Department of Ecology, 2002. How to Do Guide for Stormwater Sampling at Industrial Facilities. Publication #02-10-071. December 2002 (Rev. 1/05).

LIMITATIONS

This Work Plan was prepared exclusively for GE Energy by AMEC Earth & Environmental, Inc. This Storm Water Monitoring Work Plan is intended to be used by GE Energy, for the property located at 2727 NW 29th Avenue, Portland, Oregon, only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on this Work Plan by any third party is at that party's sole risk.

In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the sampling activities proposed in this Work Plan may not be valid. If additional information becomes available, it should be provided to AMEC so the original conclusions and recommendations can be modified as necessary.

TABLES

Table 1
Proposed Storm Water Sampling Plan
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Proposed Sampling Location	Reason For Including the Proposed Sampling Location	Requirements of Field Sampling Plan							
		Sample Media	Sampling Frequency	Sample Type	Field Visual Observations	Field Indicators	Sample Volume	Analysis	
								Total	Filtered
North Yard Catch Basins (CB1R, CB2R, CB3R, and CB8) and South Parking Lot Catch Basin (CB9)	Provide qualitative information from on-site catch basin related to possible on-site sediment sources and identify site-specific constituents of interest.	Catch Basin Solids	Once	One-Time Grab	Color, Odor, and Sheen.	Not Applicable	9 ounces	Total Metals, PAHs, Phthalates, PCBs, TPH DRO, PSD	Not Applicable
South Parking Lot Discharge, at Sampling Vault SV1	Provides data for discharge from the south parking lot to the public sanitary sewer system. Data will be used to evaluate the effectiveness of on-site improvements and for comparison to media-specific Portland Harbor SLVs.	Storm Water	4 events ¹	Flow-Weighted Composite ²	Color, Odor, Debris, and Sheen (Evaluated at CB9)	Rainfall Intensity, Flow, Temperature, pH, Conductivity, and Turbidity	8 Liters ³	Total Metals, PAHs, PCBs, TPH DRO, TSS, TOC, PSD	Dissolved Metals, PAHs, PCBs, DOC, TPH DRO
North Yard and Roof Drain Discharge, at Manhole MH2	Provides data for discharge from the the main building roof and North Yard to the public storm water sewer system. The data will be used to evaluate the effectiveness of on-site improvements and comparison to media-specific Portland Harbor SLVs.	Storm Water	4 events ¹	Flow-Weighted Composite ²	Color, Odor, Debris, and Sheen (Evaluated at CB1R, CB2R, CB3R, and CB8)	Rainfall Intensity, Flow, Temperature, pH, Conductivity, and Turbidity	8 Liters ³	Total Metals, PAHs, PCBs, TPH DRO, TSS, TOC, PSD	Dissolved Metals, PAHs, PCBs, DOC, TPH DRO

Notes

- ¹ - Sampling criteria must be met for sampling to occur. Criteria includes: dry period of at least 24 hours prior to sampling; minimum rainfall volume forecast of 0.2-inches per storm event; and minimum estimated storm duration of 3 hours.
- ² - Samples will be collected every 15 minutes, beginning within the first 30 minutes of the storm event through hour 3, and continuing over the duration of the storm event between 3 and 24 hours at pre-determined time intervals.
- ³ - 4 liters of each 8 liter composite sample will be filtered and provided to the laboratory for dissolved analysis. The filtrate water will be generated by passing the storm water sample through a 0.1 micron Polyvinylidene fluoride (PVDF) filter. The unfiltered 4 liter composite sample will be submitted for total analysis.
- PCBs - Polychlorinated biphenyls
- PAHs - Polynuclear aromatic hydrocarbons
- Metals - Priority pollutant metals
- TPH DRO - Total petroleum hydrocarbons diesel and heavy oil range organics
- TSS - Total suspended solids
- TOC - Total Organic Carbon
- DOC - Dissolved Organic Carbon
- PSD - Particle size distribution
- SLVs - Screening level values presented in Table 3.1, Screening Level Values for Soil/Storm Water Sediment, Storm Water, Groundwater, and Surface Water, in the Portland Harbor Joint Source Control Strategy Document (Oregon Department of Environmental Quality and the U.S. Environmental Protection Agency, 2005)

Table 2
Storm Water Monitoring Parameters with Applicable Methods of Analysis,
Holding Times, Laboratory Container and Preservation Requirements
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Constituent Group	Analysis Method	Quantity/ Container Material ¹	Preservation	Holding Time
Storm Water Analysis				
ICP/AES Metals	EPA 6020/6020B	500 L HDPE	HNO ₃ to pH <2 cool to 4 °C	6 months
Mercury	EPA 7470A	250 mL HDPE	HNO ₃ to pH <2 cool to 4 °C	28 days
PAHs	EPA 8270C SIM	1 L Amber Glass	Cool to 4 °C	7/40 days ²
PCBs	EPA 8082	1 L Amber Glass	Cool to 4 °C	7/40 days ²
Diesel-Range Organics	NWTPH-Dx	1 L Amber Glass	HCl to pH<2 Cool to 4 °C	7 days
Total Suspended Solids	EPA 160.2	1 L HDPE	Cool to 4 °C	7 days
Total and Dissolved Organic Carbon	EPA 415.1	1 L HDPE	Cool to 4 °C	7 days
Particle Size Distribution	PLM/SEM	1 L HDPE	Cool to 4 °C	-
Catch Basin Solid Analysis				
ICP/AES Metals	EPA 6020/6020B	9 oz Glass Jar ²	Cool to 4 °C	6 months
Mercury	EPA 7470A/7471	9 oz Glass Jar ²	Cool to 4 °C	28 days
PAHs and Phthalates	EPA 8270C SIM	9 oz Glass Jar ²	Cool to 4 °C	14 days
PCBs	EPA 8082	9 oz Glass Jar ²	Cool to 4 °C	14 days
Diesel-Range Organics	NWTPH-Dx	9 oz Glass Jar ²	Cool to 4 °C	7 days
Particle Size Distribution	PLM/SEM	9 oz Glass Jar ²	Cool to 4 °C	-

Notes:

ICP-AES - inductively coupled plasma-atomic emission spectrometry

mL - milliliter

HDPE - high-density polyethylene

HNO₃ - nitric acid

°C - degrees Centigrade

HCl - hydrochloric acid

PCBs - polychlorinated biphenyls

SIM - selective ion monitoring

PAHs - polynuclear aromatic hydrocarbons

GWM - glass wide-mouth jar with Teflon cap liner

g - grams

L - liters

PLM/SEM - Polarized light microscopy/scanning electron microscopy

¹ Multiple tests may be performed from the container so an individual jar may not be required for each individual test.

² Number of days from time of collection until extraction/number of days from time of extraction until analysis

Table 3
Project Screening Level Values
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Method	Constituent	Total Storm Water Screening Level Values ¹				Catch Basin Sediment Screening Level Values ¹	
		Human Health Fish Consumption ²	Human Health Ingestion ³	Ecological ⁴	Oak Ridge National Laboratory's (Tier II SCV)	Toxicity ⁵	Bioaccumulation ⁶
	Units	ug/L	ug/L	ug/L	ug/L	ug/kg	ug/kg
Metals by EPA 6020, 6020B or 7470A/7471A	Aluminum (pH 6.5-9.0)	-	(50-200)	87	-	-	-
	Antimony	640	6	30	30	64,000	10,000
	Arsenic	0.14	0.045	150	3.1	33,000	-
	Cadmium	5	5	0.094	-	4,980	3
	Chromium, total	-	100	-	-	111,000	4,200,000
	Copper	-	1,300	2.7	-	149,000	10,000
	Lead	-	15	0.54	-	128,000	128,000
	Manganese	100	50	120	120	1,100,000	-
	Mercury	0.146	2	0.77	1.3	1,060	-
	Nickel	4,600	730	16	-	48,600	316,000
	Selenium	4,200	50	5	-	5,000	100
	Silver	-	100	0.36	0.36	5,000	-
	Zinc	26,000	5,000	36	-	459,000	3,000
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270 SIM	Naphthalene	-	0.2	620	12	561	-
	2-Methyl-phthalene	-	0.2	2.1	2.1	200	-
	Acenaphthylene	-	0.2	-	-	200	-
	Acenaphthene	990	0.2	520	-	300	-
	Fluorene	5,300	0.2	3.9	3.9	536	-
	Phenanthrene	-	0.2	-	-	1,170	-
	Anthracene	40,000	0.2	0.73	0.73	845	-
	Fluoranthene	140	0.2	-	-	2,230	-
	Pyrene	4,000	0.2	-	-	1,520	-
	Benzo(a)anthracene	0.018	0.092	0.027	0.027	1,050	-
	Chrysene	0.018	0.2	-	-	1,290	-
	Benzo(b)fluoranthene	0.018	0.092	-	-	-	-
	Benzo(k)fluoranthene	0.018	0.2	-	-	13,000	-
	Benzo(a)pyrene	0.018	0.0092	0.014	0.014	1,450	-
	Indeno(1,2,3-cd)pyrene	0.018	0.092	-	-	100	-
	Dibenz(a,h)anthracene	0.018	0.0092	-	-	1,300	-
	Benzo(g,h,i)perylene	-	0.2	-	-	300	-
Phthalates by EPA 8270 SIM	Di-n-butylphthalate	4,500	3,600	3	-	100	-
	Bis(2-ethylhexyl)phthalate	2.2	4.8	3	-	800	330
	Di-n-octyl phthalate	1,500	1,500	3	-	-	-
	Dimethyl Phthalate	1,100,000	340,000	3	-	-	-
	Diethylphthalate	44,000	29,000	3	210	400	-
	Butylbenzylphthalate	1,900	7,300	3	19	-	-
Polychlorinated Biphenyl (PCB) Aroclors by EPA 8082	Aroclor 1016	-	0.96	-	-	530	420
	Aroclor 1221	-	-	0.28	0.28	-	-
	Aroclor 1232	-	-	0.58	0.58	-	-
	Aroclor 1242	-	-	0.053	0.053	-	2
	Aroclor 1248	-	-	0.081	0.081	1,500	4
	Aroclor 1254	-	0.034	0.033	0.033	300	10
	Aroclor 1260	-	-	94	94	200	-
	Aroclor 1262	-	-	-	-	-	-
	Aroclor 1268	-	-	-	-	-	-
	Total PCBs	0.000064	0.034	0.14	0.14	-	-
Total Petroleum Hydrocarbons by NWTPH-Dx	Diesel Range Organics	-	-	-	-	-	-
Convental Chemistry Parameters	Total Suspended Solids	-	-	-	-	-	-
	Total Organic Carbon	-	-	-	-	-	-
	Dissolved Organic Carbon	-	-	-	-	-	-
	Particle Size Distribution	-	-	-	-	-	-

¹-The screening level values (SLVs) are presented in Table 3.1, Screening Level Values for Soil/Storm Water Sediment, Storm Water, Groundwater, and Surface Water, in the Portland Harbor Joint Source Control Strategy Document (JSCA) (DEQ/EPA, 2005).

²-The SLVs for chemicals in water taken up by fish for human consumption represent EPA's NRWQC values. If no NRWQC values are available, then DEQ's AWQC values are indicated for the constituent.

³-The SLVs for chemicals in water for human ingestion represent the most conservative value between EPA's MCLs and Region 9 PRGs.

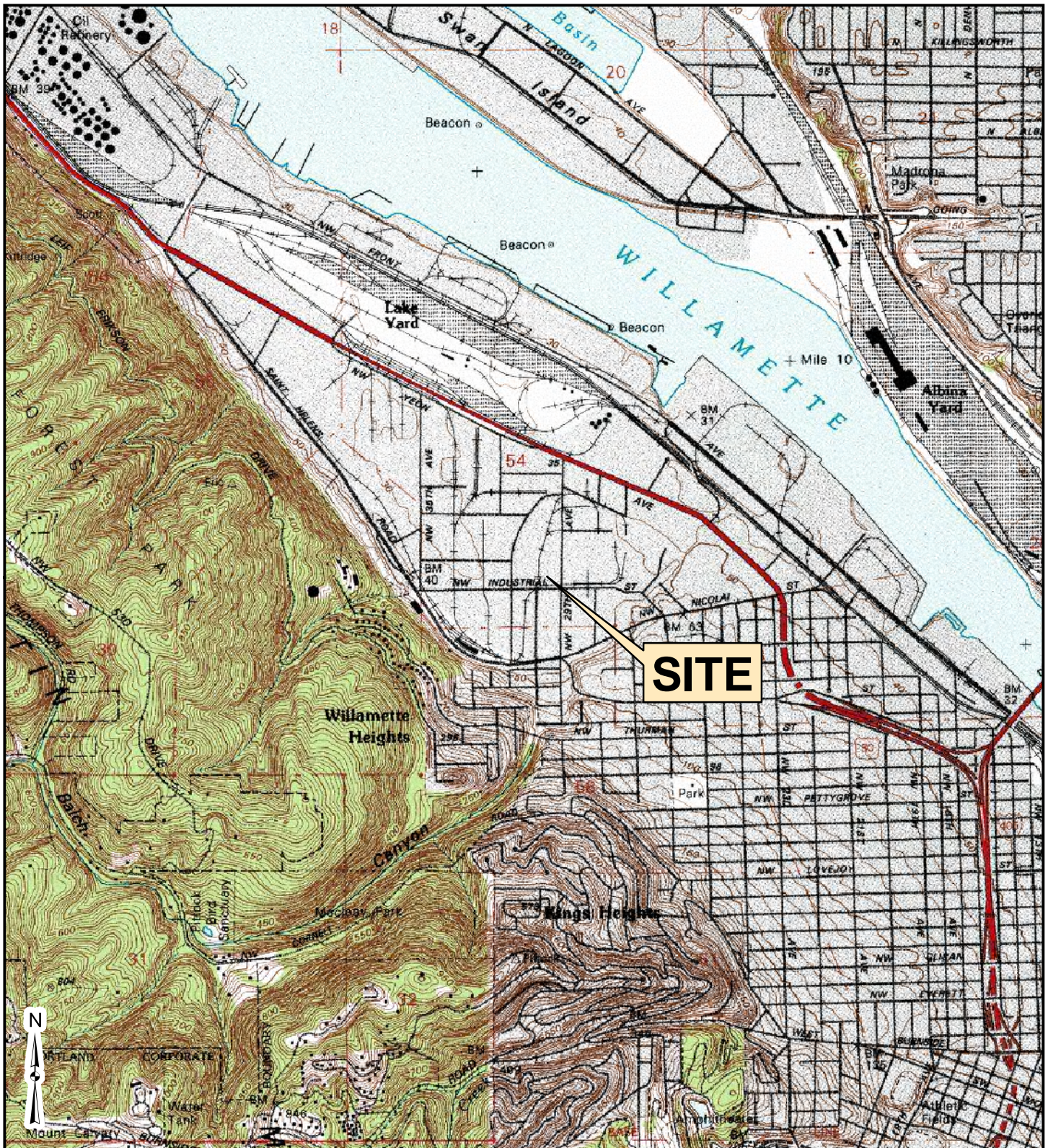
⁴-The toxicity SLVs for chemicals in water for ecological exposure represent EPA's NRWQC values. If no NRWQC values are available, then DEQ's AWQC values are listed for the constituent. If no AWQC values are available then ORNL Technology Benchmark values

⁵-The toxicity SLVs for chemicals in catch basin sediment represent MacDonald's PECs. If no PEC values are available, then other probable effect levels found in various literature sources (see Table 3-1footnotes for details on other various literature sources)

⁶The SLVs for potential bioaccumulative chemicals in soil and storm water sediments for ecological exposure represent values, developed by DEQ and presented in the December 2001 "Level II Ecological Risk Assessment Guidance" document.

EPA - United States Environmental Protection Agency
DEQ - Department of Environmental Quality
NRWQC - National Recommended Water Quality Criteria
AWQC - Ambient Water Quality Criteria
MCL - Maximum Contaminant Level
PRG - Preliminary Remediation Goals
ORNL - Oak Ridge National Laboratory
PECs - Probable Effect Concentrations
SIM - Selective Ion Monitoring
ug/L - micrograms per liter
ug/kg - micrograms per kilogram
- Not Available

FIGURES



USGS Quad 45122E6 Portland

0 1,000 2,000 4,000 Feet
1 inch equals 2,000 feet

FIGURE 1



W.O. 6-61M-11286-7 P4
DESIGN AH
DRAWN BRJ/PAM
DATE JANUARY 2007

GE I&RS CENTER
2727 NW 29TH AVENUE
PORTLAND, OREGON

SITE LOCATION MAP

7376 SW Durham Road
Portland, OR, U.S.A. 97224

LEGEND

⊙/⊙ Proposed Storm Water Sampling Location

⊙ Existing COP Manholes

--- COP Combined Sewer

--- COP Sanitary Sewer

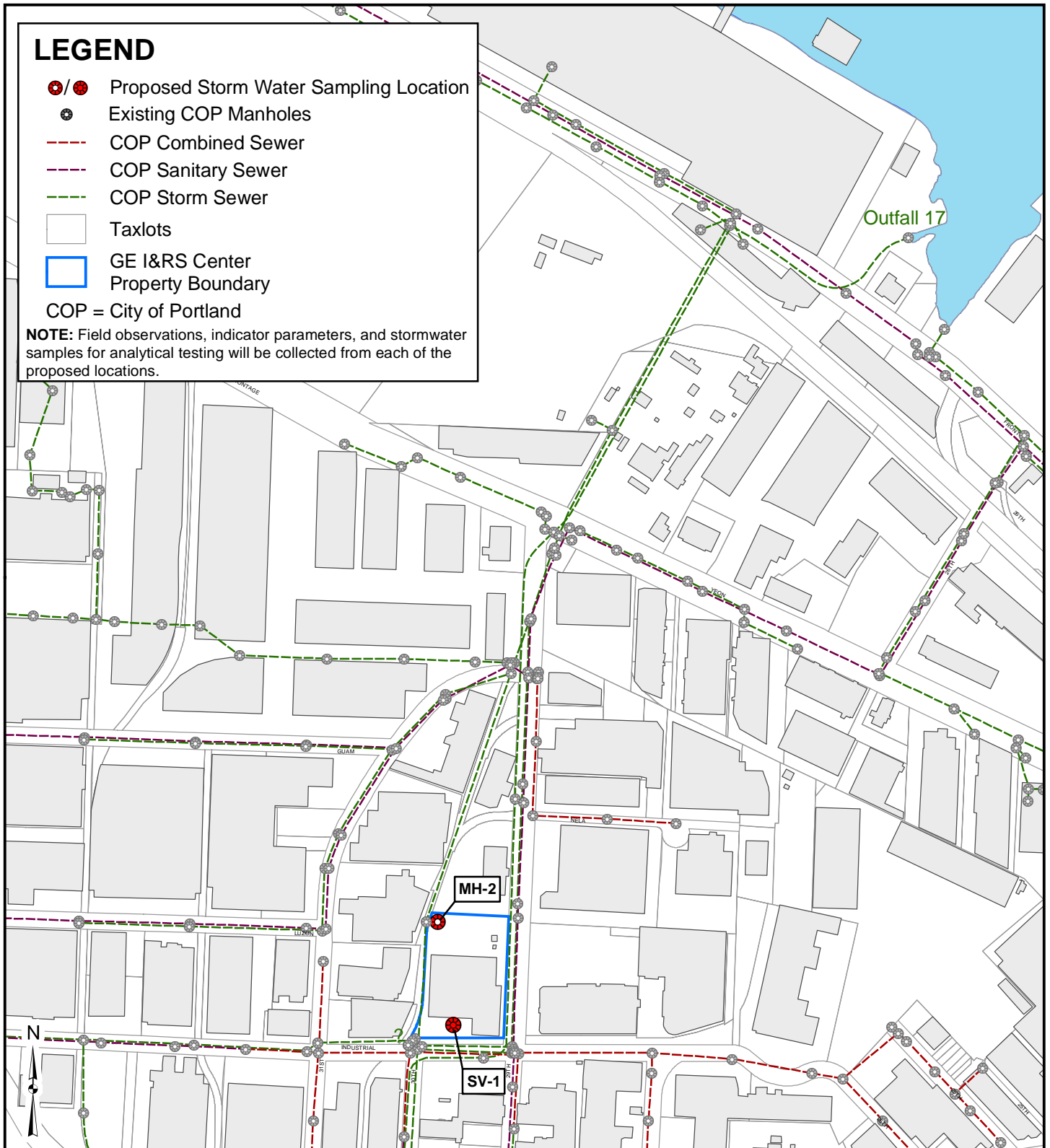
--- COP Storm Sewer

□ Taxlots

□ GE I&RS Center
Property Boundary

COP = City of Portland

NOTE: Field observations, indicator parameters, and stormwater samples for analytical testing will be collected from each of the proposed locations.



Taxlots and building_footprints_pdx_oct layers
from Metro Data Resource Center.

Public sewer information obtained from City of Portland,
Bureau of Environmental Services on 03/28/05.

Modified by AMEC to add manhole UNK-MH to public sewer system, as identified in 09/28/04 and 09/28/05 investigation.

0 250 500 1,000
Feet
1 inch equals 500 feet

FIGURE 3



7376 SW Durham Road
Portland, OR, U.S.A. 97224

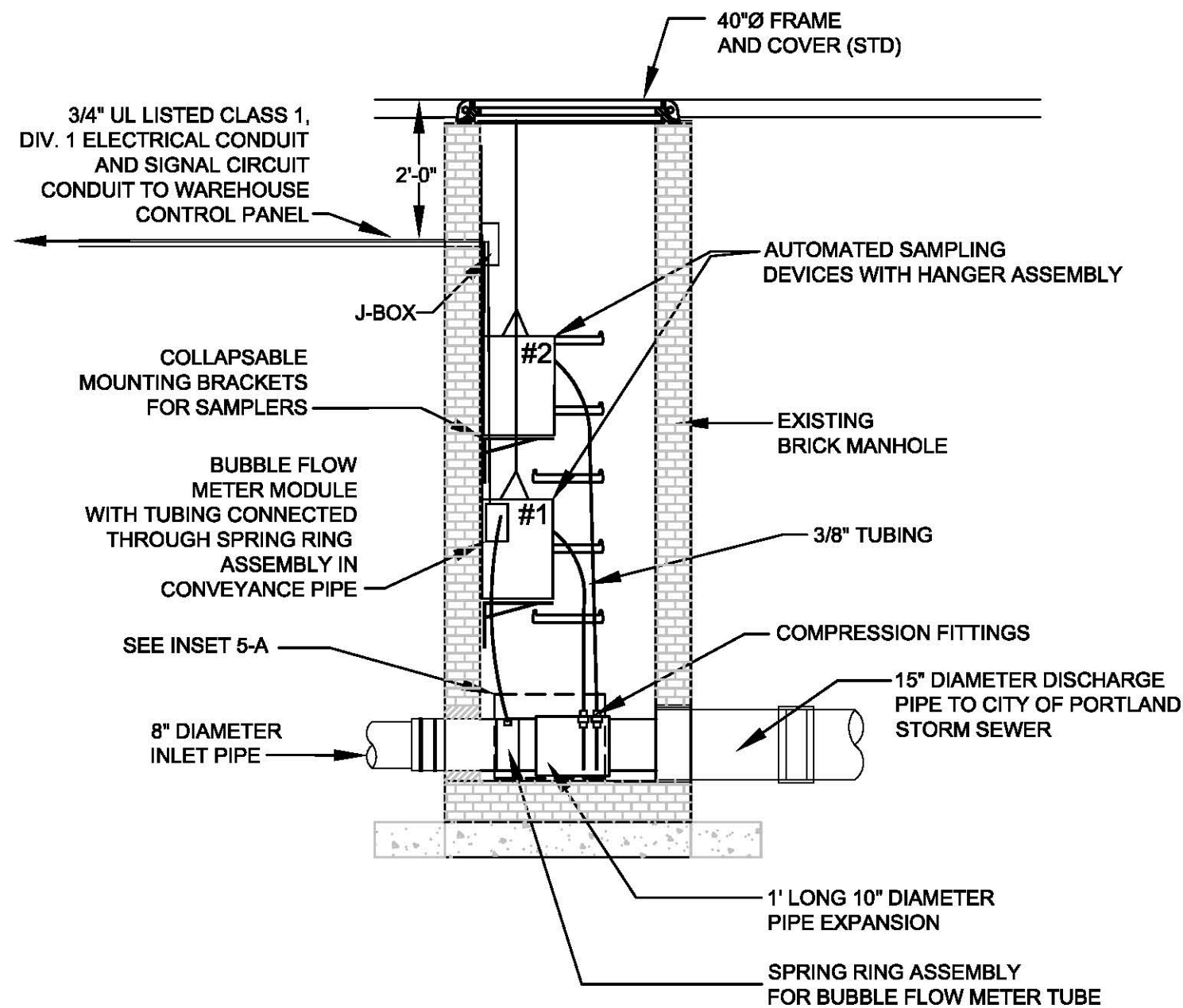
W.O. 6-61M-11286-7 P4
DESIGN AH
DRAWN BRJ/PAM
DATE JANUARY 2007

GE I&RS CENTER
2727 NW 29TH AVENUE
PORTLAND, OREGON

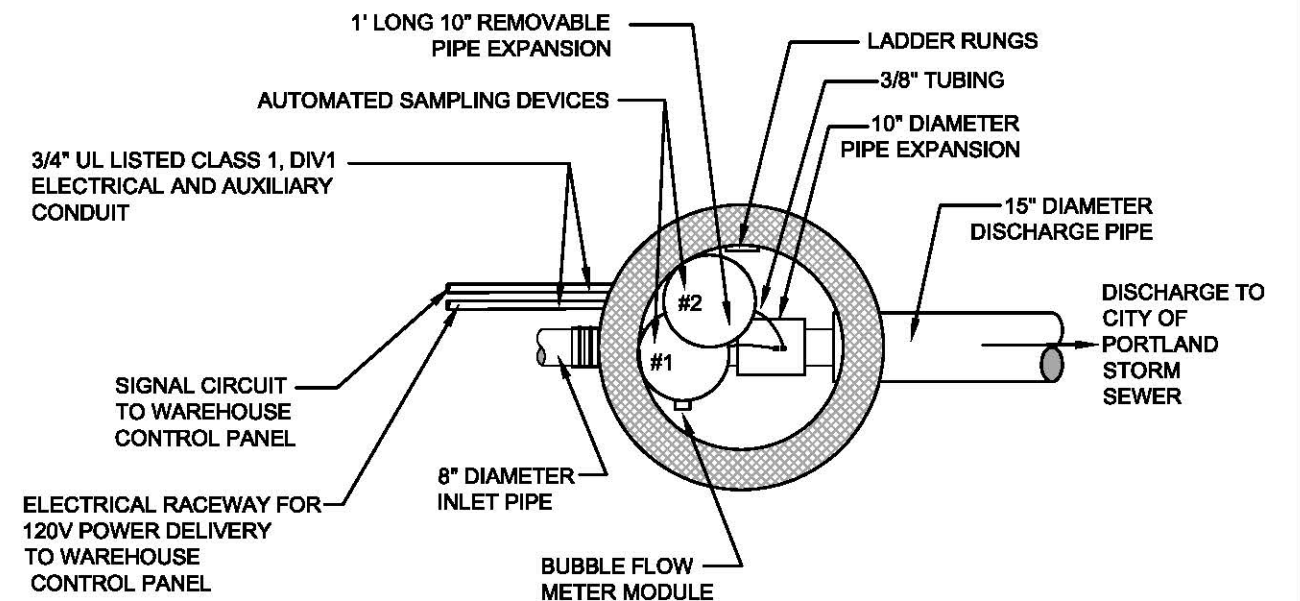
OUTFALL 17 SEWER CONVEYANCE MAP

NOTES

- A. SAMPLING DEVICE #1 - 12-bottle configuration, including 12 glass 950 ml round bottles, programmed to collect one sample every 15 minutes for a duration of 3 hours.
- B. SAMPLING DEVICE #2 - 24-bottle configuration, including 24 glass 350 ml round bottles, programmed to collect one sample every hour for duration up to 24 hours.
- C. FLOW METER MODULE- tubing connected from module through standard spring ring assembly installed within an 8-inch diameter pipe.

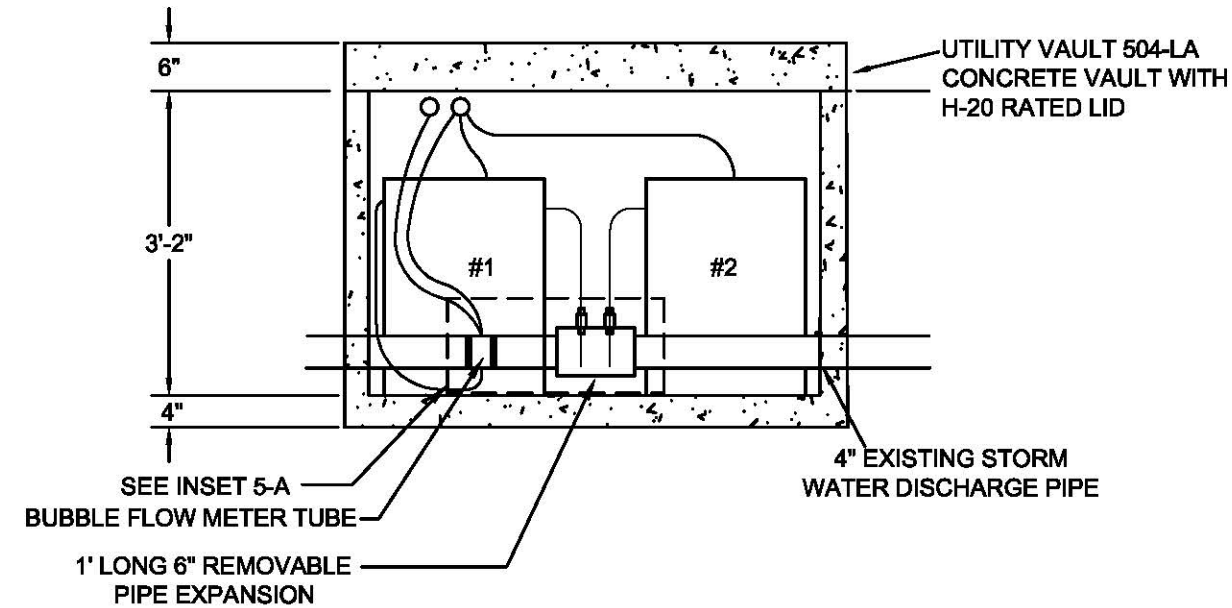


MANHOLE (MH2) SIDE VIEW FROM THE EAST
NTS

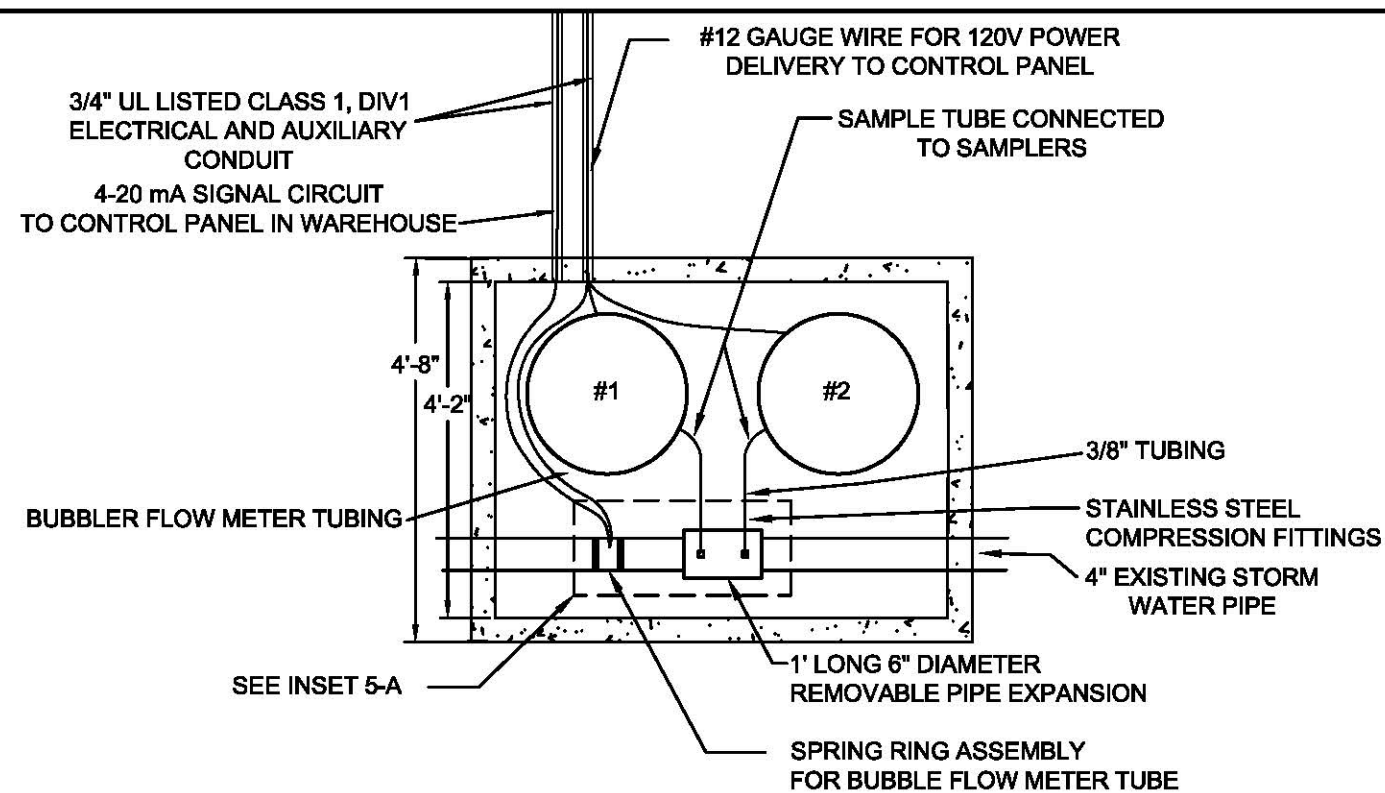


MANHOLE (MH2) TOP VIEW
NTS

				CLIENT:		DWN BY: MK		PROJECT		DATE:	
				GE ENERGY SERVICES		CHK'D BY: HR		GE I&RS CENTER		JANUARY 2007	
						DATUM: -		2727 NW 29TH AVENUE		PROJECT NO:	
						PROJECTION: -		PORTLAND, OREGON		6-61M-11286-7 P-4	
						SCALE: NTS		TITLE		REV. NO.:	
								NORTH YARD		2	
								MH2 SAMPLING EQUIPMENT DETAIL		FIGURE No.	
										4	



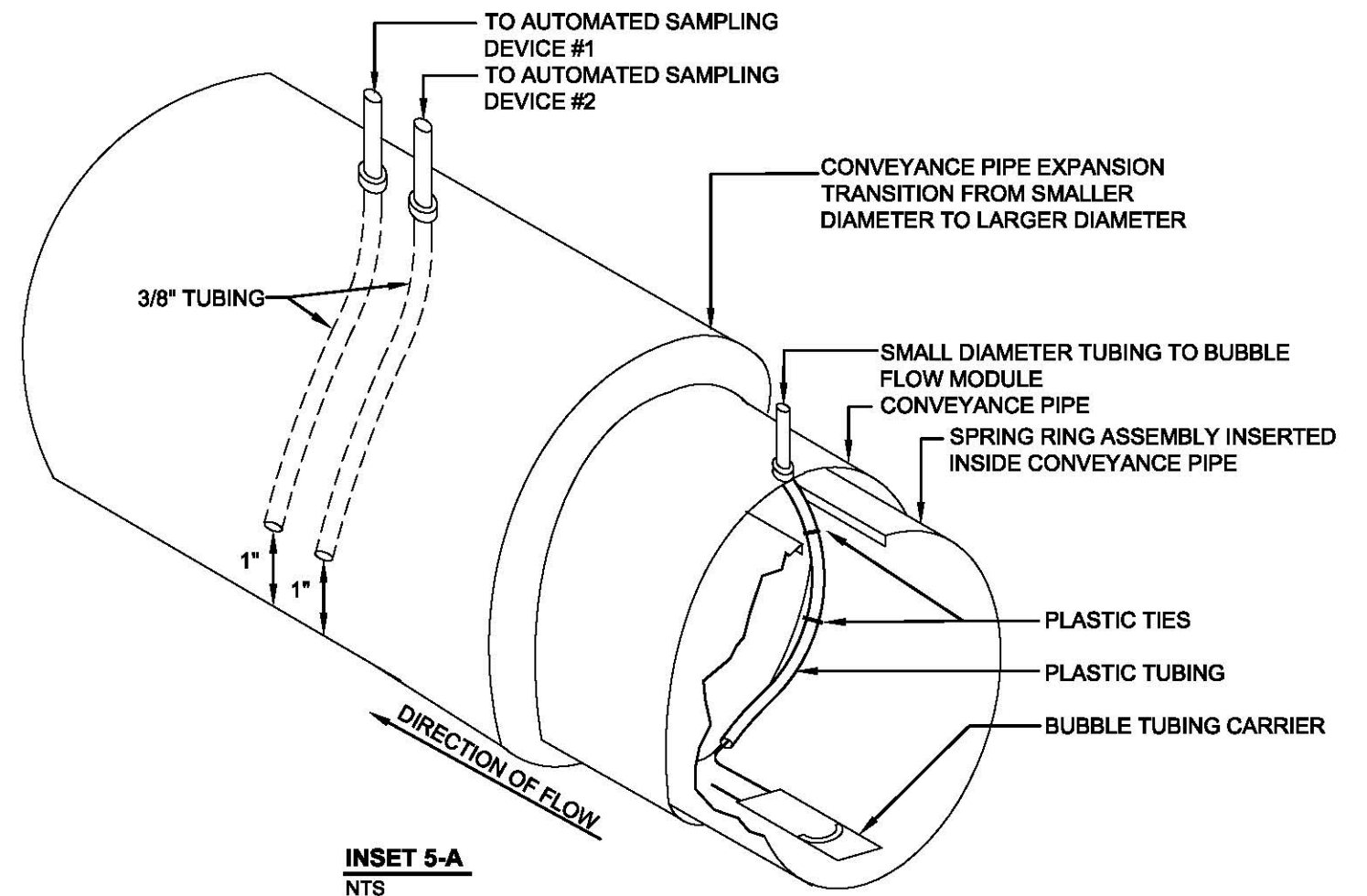
VAULT (SV1) SIDE VIEW FROM SOUTH
NTS



VAULT (SV1) TOP VIEW
NTS

NOTES

- A. SAMPLING DEVICE #1 - 12-bottle configuration, including 12 glass 950 ml round bottles, programmed to collect one sample every 15 minutes for a duration of 3 hours.
- B. SAMPLING DEVICE #2 - 24-bottle configuration, including 24 glass 350 ml round bottles, programmed to collect one sample every hour for duration up to 24 hours.
- C. FLOW METER MODULE- tubing connected from module through standard spring ring assembly installed within an 4-inch diameter pipe.



INSET 5-A
NTS

NOTE: DETAILS BASED ON FIGURE PROVIDED BY BUBBLE FLOW METER VENDOR.

				CLIENT:		DWN BY:	PROJECT		DATE:
				GE ENERGY SERVICES		RK/DD/LM	GE I&RS CENTER		JANUARY 2007
						CHK'D BY:	2727 NW 29TH AVENUE		PROJECT NO:
						HR	PORTLAND, OREGON		6-61M-11286-7 P-4
						DATUM:	TITLE		REV. NO.:
						-	SOUTH PARKING LOT		2
						PROJECTION:	SV1 SAMPLING EQUIPMENT DETAIL		FIGURE No.
						-			5
						SCALE:			
						NTS			

AMEC Earth & Environmental		7376 S.W. Durham Road Portland, OR. U.S.A. 97224
7376 S.W. Durham Road Portland, OR. U.S.A. 97224		

REV	D	M	Y	ISSUE/REVISION DESCRIPTION	ENG.	APPR.

APPENDIX A

Standard Operating Procedures

- SOP-1 Storm Water Handling and Compositing Procedure
- SOP-2 Field Parameter Measurement for Storm Water Discharge Sampling
- SOP-3 Decontamination Procedure
- SOP-4 Guidance for Sampling of Catch Basin Solids

SOP-1 STORM WATER HANDLING AND COMPOSITING PROCEDURES

The following standard operating procedure (SOP) will be used by AMEC Earth & Environmental, Inc. (AMEC) during activities conducted on behalf of GE Energy (GE) at the property located at 2727 NW 29th Avenue in Portland, Oregon (Site). The suggested sampling procedures presented in the Portland Harbor Joint Source Control Strategy (JSCS) document (Oregon Department of Environmental Quality [DEQ] and U.S. Environmental Protection Agency [EPA], 2005) were considered when developing this SOP.

1.0 PURPOSE

The purpose of this SOP is to provide a description of the methods used for storm water sampling from manhole MH-2 located in the North Yard and storm vault SV1 located in the south parking lot of the Site. Storm water sampling will be conducted in order to obtain representative samples of Site storm water runoff.

2.0 EQUIPMENT LIST

Only dedicated sampling equipment will be used for collecting the storm water samples. The sampling equipment includes, but may not be limited to, the following items:

1. Storm water sampling devices (two for each sampling location)
2. Flow meter (one per sampling location)
3. Rain Gauge meter (one for the site, situated on the warehouse roof)
4. Sampler hanger assemblies (one per sampling device located in MH2)

Other equipment and materials that will be used during sample handling activities at the Site include, but may not be limited to, the following items:

1. Manhole opener or crow bar
2. Manhole guard rail
3. Traffic cones
4. Flashlight
5. Trash bags
6. Labels, chain-of-custody (COC), and cooler(s) with ice
7. New 3/8" tubing, or equivalent (~25 feet per sampler)

8. Replacement unpreserved glass sample collection bottles
9. Indelible pens
10. Field notebook
11. Site Health and Safety Plan (HASP)
12. Personal protective equipment (PPE) appropriate for Site (see HASP)
13. Equipment necessary for confined space entry (see HASP)
14. Decontamination sampling equipment

Other equipment and materials that will be used while preparing composite samples for laboratory analysis will include, but may not be limited to:

1. Sample Preparation Form (SPF)
2. 8 Liter glass sample composite containers (2)
3. Filtration Apparatus (funnel, vacuum pump, etc.)
4. Polyvinylidene fluoride (PVDF) filters, 0.1 micron in size
5. Laboratory prepared sample containers

3.0 CATCH BASIN MONITORING

Catch basin sumps are designed to capture settled debris and sediment during non-high volume flow events. When catch basin sumps contain too much accumulated debris and sediment, the material can become re-suspended during flow events and potentially lead to its unwanted discharge to the storm water sewer system. Debris and sediment accumulating in the catch basins will be monitored and measured during each storm water sampling event. The measurements recorded will determine if and when catch basin catch basin solids will be sampled. Samples of the debris and sediment, if collected, will be conducted in accordance with the "Guidance for Sampling of Catch Basin Solids" prepared for the City of Portland in 2003.

3.1 Visual Observations Procedure

1. Record visual observations of standing water including color, odor, debris, and sheen from each catch basin sump (CB1R, CB2R, CB3R, CB8, and CB9) in the field notebook.

2. Measure the depth to accumulated solids, if any, from each catch basin sump (CB1R, CB2R, CB3R, CB8, and CB9), as indicated below.

3.2 Catch Basin Solids Measurement Procedure

1. Remove the metal grate covering the catch basin sump.
2. Use a measuring stick to record the depth to solids present in the sump.
3. Collect and record the depth readings at each catch basin, relative to the top of the steel catch basin rim in the field note book. Readings should be collected from each of the four corners and from the center of each basin and recorded in the field notebook.
4. Replace the metal grate cover.

4.0 Storm Water Sample Collection Procedure

The JSCS requires routine monitoring of storm water discharge to the Willamette River through storm water conveyance systems from upland facilities in the Portland Harbor. Storm water samples will be collected at the site through the use of automated sampling devices during a representative storm event. Two individuals will be required to retrieve the collected samples from the automated sampling devices, using the following procedures:

1. Open manhole cover or vault lid using manhole opener or crow bar and then assemble the manhole guard rail over open manhole.
2. Enter the manhole or vault following the HASP requirements for safe entry into confined and unconfined spaces.
3. Verify that automated sampling devices have completed sampling and that sampler is not actively pumping samples.
4. Using the hanger assemblies, remove the automated sampling devices from the manhole, taking care not to angle the sampling devices in the process.
5. Place each sampling device on a clean level surface.
6. Open the sampling device and remove the individual sample containers from the sampling device, labeling and capping each sample as it is removed.
7. Place the capped and labeled containers into a cooler packed with ice. Record each sample in the field note book.

8. Collect a field blank sample by running de-ionized water through the used sample tubing.

Note: The next several tasks can be done at the same time the samples are removed from the sampling device, or can be postponed, depending on the weather conditions at the Site. If the following tasks are postponed, skip to #14.

9. Place new sample containers into the sampling device.
10. Place new sample tubing in the sampling device. Place the suspended end of the tubing into a clean bucket or basket.
11. One individual shall enter the manhole or vault.
12. The individual outside the manhole or vault shall lower the bucket or basket using a rope to the bottom of the manhole or vault.
13. The individual inside the manhole or vault shall connect new tubing through the existing compression fitting into each sampling location.
14. The individual outside of the manhole or vault shall lower the automated sampling devices to the individual inside the manhole or vault, who will secure each device in place at its designated location.
15. Exit the manhole or vault.
16. Disassemble the manhole guard and slide the lid back onto the manhole.
17. Place discarded disposable PPE into the trash bag, which will ultimately be placed into a drum at the Hazardous Material Storage Area (refer to Project-Specific Procedures, identified in the Storm Water Monitoring Work Plan).
18. Transport samples to appropriate location to prepare the composite samples (AMEC office, GE I&RS Center Warehouse, etc).

5.0 RAIN EVENT MAGNITUDE DETERMINATION

The JSCS (DEQ/EPA, 2005) sets storm criteria for sampling events that include an antecedent dry period of at least 24 hours, a minimum predicted rainfall volume of more than 0.2 inches per event, and expected storm duration of at least 3 hours. The criteria ensure that storm water runoff will be sufficient for sampling, will be representative of runoff, and will be consistent with evaluations conducted at other sites. Rainfall will be recorded at the Site using an automated rain gauge, located on the roof of the warehouse. The rainfall intensity must be calculated from the data recorded during the sampling event. Rainfall volume data will be electronically

downloaded according to rain gauge manufacturer instructions. The rain event magnitude will be determined and recorded on the attached Sample Preparation Form (SPF).

6.0 DISCHARGE FLOW RATE DETERMINATION

As indicated in the JSCS (DEQ/EPA, 2005) storm water discharge events are highly variable in terms of flow and pollutant concentrations and the relationship between discharges can be complex. The discharge flow rates from the Site will be continuously measured and recorded using automated flow meters located within the discharge lines in MH2 and SV1. The flow meter readings will provide accurate hydrograph data for the Site, as well as provide relative changes in the storm water volume discharged from the Site. Flow rate data will be electronically downloaded according to flow meter manufacturer instructions.

7.0 STORM WATER SAMPLE PREPARATION FOR ANALYSIS

Storm water sampling allows the facility to characterize storm water discharge and evaluate the effectiveness of best management practices (BMPs) in removing pollutants from storm water. Individual aliquots will be collected to provide additional information about Site conditions throughout the storm event. A composite sample of the individual aliquots will be prepared for laboratory analysis.

7.1 Storm Water Composite Preparation Procedure

1. Using a computer with the appropriate software, download the rain gauge, and flow meter data, according to the manufacturer instructions. Attach a printout of the data to the SPF.
2. Determine the volume of each of the individual sample aliquots necessary to prepare a composite, considering the total volume should be proportional to the flow rate based on the following formula:

$$AV = MAV \times ADV / LDV$$

Where:

AV = Aliquot volume (milliliters)

MAV = Minimum aliquot volume (milliliters)

ADV = Aliquot discharge volume (liters)

LDV = Largest discharge volume (liters)

3. Prepare a composite sample for each of the sample locations (MH2 and SV1) based on the required volumes determined for each aliquot. Do not overfill the sample container.

4. Transfer 200 milliliters from each composite sample into a separate container. Do not overfill sample container. Measure and record each 200 milliliter sample for Field Indicator Parameters (Temperature, pH, Conductivity, Turbidity) on the SPF. (Follow steps in Section 7.2 for equipment preparation and measurement collection procedure.)
5. Filter 4 Liters from each 8 Liter composite sample through a 0.1 micron PVDF filter into a clean sample container. Do not overfill the sample container. Label each 4 Liter (filtered or total) sample container.
6. Transfer the 4-Liter unfiltered and the 4-Liter filtered samples into the appropriate laboratory prepared sample containers for each of the sample locations, MH2 and SV1. Label each sample container, place them into a cooler packed with ice, and record each sample on the chain of custody.
7. Package and ship samples for overnight delivery to laboratory.

7.2 Field Indicator Parameter Collection Procedure

1. Calibrate the Yellow Springs Instrument (YSI) (water quality meter) and turbidity meter according to manufacturer instructions.
2. Fill the container with sample water using sample techniques described above.
3. Submerge the YSI probe into a filled container. For turbidity, clean and dry the outside vial with the provided cloth.
4. Follow manufacturer instructions and procedures for sample analysis with the YSI. For turbidity, always insert the vial into the meter with the same alignment.
5. Record parameter measurements on the SPF.

7.3 Site-Specific Sample Containers

Only sample containers that have been stored for up to 6 months will be used. All older containers will be discarded.

Two 4 Liter composite samples will be prepared, one 4 Liter filtered for dissolved analysis, and the other 4 Liter unfiltered for total analysis for each sampling location. Filtered and unfiltered composite samples will be partitioned into the appropriately preserved sample containers listed in Table 2 of the Revised Storm Water Sampling Work Plan. The storm water samples will be submitted to the laboratory for the following constituents:

1. Total and Dissolved Polycyclic aromatic hydrocarbons

2. Total and Dissolved Polychlorinated biphenyls
3. Total and Dissolved Metals
4. Total petroleum hydrocarbons, diesel range organics (DRO)
5. Total suspended solids (TSS) and Particle Size Distribution (PDS)
6. Dissolved Organic Carbon (DOC)

**FIELD FORM A
SAMPLE PREPARATION FORM
DOCUMENTATION FOR STORM WATER SAMPLING
GE PORTLAND I&RS CENTER**

Date: _____

Time on-Site: _____ Time off-Site: _____
(Record data from the field notebook)

Name of person and company collecting the samples: _____

Name of person and company conducting the catch basin examination: _____

Weather conditions: _____

Site conditions: _____

STORM WATER VISUAL QUALITY INDICATORS:

(Describe if present use space provided for additional notes)

Storm Water Visual Quality Indicators						
Catch Basin	Flow (Y/N)	Average Depth to solids (IN)	Color (Describe)	Odor (Describe)	Sheen Present (Y/N)	Debris Present (Describe)
CB1R						
CB2R						
CB3R						
CB8						
CB9						

Additional Notes: _____

Storm Water Samples Collected (circle): y / n

Samples put on ice (circle): y / n

RAIN EVENT MAGNITUDE DETERMINATION

Rain Gage data attached (check) ☐

Date of previous storm event greater than 0.1 inches: _____

Magnitude of storm: _____

(Must be ≥ 0.2 " in 24 hrs – Download site-specific Rain Gage data to verify storm magnitude, also see http://or.water.usgs.gov/non-usgs/bes/raingauge_info/clickmap.html)

Rainfall Information		
Time Rainfall Began	Time Discharge Began	Rain Gauge Reading at End of Sampling (inches)

DISCHARGE FLOW RATE DETERMINATION

Flow Meter data attached (check) ☐

SAMPLE COMPOSITE VOLUME PROPORTION DETERMINATION

Sample Volume Proportions Calculated and Worksheet attached (check) ☐

MH2 Sample Composite Date: _____ Time: _____ Prepared By: _____

SV1 Sample Composite Date: _____ Time: _____ Prepared By: _____

Notes: _____

FIELD INDICATOR PARAMETER MEASUREMENTS

Field Indicator Parameter Measurements					
Sample Location	Time	Temperature (°C)	pH (S.U.)	Turbidity (NTUs)	Specific Conductivity (ms)
MH2					
SV1					

STORM WATER SAMPLE PREPARATION FOR LABORATORY ANALYSIS

Storm Water Sample Preparation					
Sample Location	Date	Time	Name of Person Filtering the Composite Sample	Total Volume	Filtered Volume
MH2					
SV1					

Laboratory Sample Containers Filled (circle): y / n
(See Table 2 of Revised Storm Water Sampling Work Plan for Container Requirements)

Samples put on ice (circle): y / n

Copy of the COC attached (check) ☐

Samples packaged and shipped overnight to laboratory (check) ☐

By: _____

Date: _____

WASTE HANDLING PROCEDURES

Volume of water generated: _____

Types and approximate amounts of solid waste generated: _____

OTHER

Problems encountered: _____

Additional observations: _____

Recent BMP maintenance or condition of BMPs: _____

SOP-2 FIELD INDICATOR MEASUREMENT FOR STORM WATER DISCHARGE SAMPLING

The following standard operating procedure (SOP) will be used by AMEC Earth & Environmental, Inc. (AMEC) during activities conducted on behalf of GE Energy (GE) at the property located at 2727 NW 29th Avenue in Portland, Oregon (Site).

1.0 PURPOSE

Measurements of composite storm water sample pH, air and water temperature, conductivity, and turbidity will be obtained with calibrated instruments, prior to filtering 4 Liters of the 8 Liter composite sample.

2.0 EQUIPMENT LIST

1. Portable, battery-powered multi-probe equipment (e.g., YSI 650 MDS or YSI 610) with calibration solutions and instructions
2. Turbidity meter with calibration solutions and instructions.
3. Appropriate field forms for recording readings and/or field logbook with indelible pens
4. Knife or scissors
5. Decontamination equipment (see SOP-3 Decontamination Procedure and sampling plan for additional site-specific requirements)
6. Site map and Site Health and Safety Plan (HASP)
7. Personal protective equipment (PPE) appropriate for Site (see HASP)

3.0 PROCEDURE

Procedures for collection of specific field parameters are provided in the sections below.

Temperature, pH, and Specific Conductance

Field measurements for temperature, pH, and specific conductance will be collected with portable, battery-powered instruments (e.g., YSI 650 MDS or YSI 610 D multi-probes). Procedures for calibration and measurements are outlined in the user manuals included with these instruments. These instruments will be calibrated each day before sampling activities begin. These field parameters will be measured by using a representative sample of storm water. To collect the measurements, lower the probe into the storm water sample container. Record the parameter readings on the

display panel of the YSI meter onto the appropriate field form. The probe will be decontaminated following use, as outlined in SOP-3.

Measurements for Turbidity

Turbidity will be measured once per sample immediately prior to filling sample bottles. Turbidity will be measured using appropriate portable, battery-powered field equipment and results will be recorded in nephelometric turbidity units (NTU). Dilution of the sample may be required for water with high turbidity. The test vials will be decontaminated following use as outlined in SOP-3.

SOP-3 DECONTAMINATION PROCEDURE

The following standard operating procedure (SOP) will be used by AMEC Earth & Environmental, Inc. (AMEC) during activities conducted on behalf of GE Energy (GE) at the property located at 2727 NW 29th Avenue in Portland, Oregon (Site).

1.0 PURPOSE

Decontamination of non-disposable equipment is performed at the Site where there is a potential for environmental contamination. This is done to minimize the potential for cross-contamination between sampling locations (potentially resulting in unrepresentative samples and/or causing the spread of contamination) and also to protect human health and safety.

2.0 EQUIPMENT LIST

1. Distilled/Deionized water
2. Plastic buckets
3. Spray bottles
4. Disposable rags or paper towels
5. Hexane Solution
6. Site map and Site Health and Safety Plan (HASP)
7. Personal protective equipment appropriate for site (see HASP)

3.0 PROCEDURE

Sampling equipment (e.g., storm water grab sampler, water level meter, etc.) will be decontaminated as follows:

1. Soap wash (dilute solution of Alconox or equivalent in potable water solution);
2. Distilled/deionized water rinse;
3. Solvent rinse (hexane, or similar); and
4. Distilled/deionized water rinse.

The first step, a soap and water wash, removes all visible particulate matter and potential residual oil and grease. The second step involves a tap water rinse or a distilled/deionized water rinse to remove the detergent. Next, a high purity solvent rinse is performed for trace organics removal. The solvent must be allowed to

evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

Decontamination fluids will be stored in a labeled 5-gallon bucket with a lid and transported from the generation point to the hazardous waste storage area where it will be transferred into approved drums. This will occur on the day of generation. All decontamination fluids will be disposed of in accordance with applicable regulations.

Standard Operating Procedures

Guidance for Sampling of Catch Basin Solids

Prepared for
City of Portland

July 2003

Prepared by
CH2MHILL



**Printed on
Recycled and
Recyclable
Paper**

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Standard Operating Procedures—Guidance for Sampling of Catch Basin Solids

1.0 Purpose

This document describes Standard Operating Procedures (SOPs) for the collection of environmental solids samples from stormwater catch basins. It provides procedures to be used for assessing potential pathways of contamination from upland sources via stormwater conveyances to receiving waters and sediments. Sampling for environmental investigations requires different methods than those that may be used for determining waste profiles for catch basin solids disposal.

The procedures described here are intended to provide representative samples of catch basin contents. These procedures may be modified for other purposes, such as assessing characteristics of older or newer solids, or because of space or access limitations. All deviations from these SOPs should be noted in field logs and reports.

1.1 Background

Catch basins are typically designed to prevent debris, gravels, and soils from fouling storm drain lines, and generally remove larger particles (greater than approximately 1 millimeter in diameter). Unlike specially designed stormwater treatment vaults, catch basins are not intended to remove fine particles or soluble pollutants, and they may only marginally reduce concentrations of contaminants or suspended solids. Catch basin retention efficiencies for suspended solids may be highly variable as functions of basin design, stormwater flow rates, accumulated solids in the sump (a function of cleaning frequency), and solids particle characteristics. Finer particle fractions may be suspended in moving water and carried beyond the catch basin. Because these finer particles are often correlated with organic and inorganic contaminants, special care needs to be taken while collecting catch basin solids samples to ensure that the finer particle fraction is sampled.

2.0 Scope and Applicability

The methodologies discussed in these SOPs are intended to provide procedures for collecting representative environmental samples of solids in stormwater catch basins. These SOPs describe specific steps that can be used to ensure representative and comparable data.

Residual material in catch basins is inherently variable. Factors that can affect variability include the characteristics of catch basin structures, the sources of particles, water flow rates and stormwater quality, and the depth and pattern of accumulated solids. In addition, the characteristics of catch basin solids can vary from slurry-like to dry solids. Although variability may be unavoidable, standard methods of collecting and handling samples can improve data quality.

3.0 Equipment and Materials

The following equipment should be available for collecting solids samples from catch basins:

- Sampler (generally one type will be selected per catch basin)
 - Stainless steel scoop, trowel, or spoon
 - Bucket (hand) auger
 - Hand corer
 - Petite Ponar® dredge/Van Veen® dredge (0.025 square meter [m²])
- Sampling Equipment List
 - Site Sampling and Analysis Plan and/or site files detailing sampling locations, sample collection, and site information
 - Large stainless steel bowl
 - Stainless steel mixing spoon
 - Latex gloves
 - Metal or wooden rod
 - Field data sheets or other documentation
 - Laboratory-supplied sample containers
 - Cooler and ice/chilled blue ice
 - Tape measure
 - Ziploc® bags
 - Field notebook
 - Permanent marking pens
 - Sample labels
 - Chain-of-custody seals
 - Personal Protective Equipment (PPE)

4.0 Procedures

4.1 Documentation

Regardless of the equipment to be used, the following general procedures apply:

- Confirm any active catch basin best management practices such as sweeping and cleaning, frequency of activity, etc., if known.
- Document design flow rates (base flow, storm flow) for catch basins, if known.
- Record weather conditions at the time of sampling and last known rainfall event(s).
- Record the location of the catch basin. Include potential solids or contaminant sources such as construction activities, erosion, equipment storage or use, waste or material storage, vehicles, exhaust vents, onsite processes, etc. Site features, distances, flow directions, and gradients should be noted or sketched on a site map.

- Record dimensions of catch basin. Diagram inlet/outlet pipes in the catch basin. The source of inlet flows and destination of outlet flows should be noted, if known.
- Note the presence of water, visible flows, signs of flooding, clogging, debris in or around the catch basin, blocked inlets/outlets, staining, etc.
- Note any apparent evidence of contamination in the catch basin, such as odor, sheen, discoloration, etc., of water or solids.
- Measure the depth of solids in the catch basin and the total depth of the catch basin or sump. Use a decontaminated metal rod or disposable wooden dowel to probe the total depth of the catch basin.
- When recovering samples, record visual observations of:
 - Color
 - Texture, estimates of particle size fractions (as soil classification)
 - Amount and type of debris (Note: any large debris observed in the sample, including sticks, leaves, beverage containers, miscellaneous pieces of plastic and metal, stones and gravel, etc., should be removed, but paint chips and small organic matter should be left in the sample)
- Prepare a diagram of sampling locations within the catch basin, noting any special features such as sumps, inlets and outlets, etc.
- Decontaminate all sampling equipment using documented procedures before and after any sampling activities. Record the decontamination procedures in the field notes.
- Record any deviations from the specified sampling procedures or any obstacles encountered.
- Complete a chain-of-custody form for all samples.

4.2 Selection of Sampling Method

Sampling equipment should be matched with the presence and depth of water, solids water content, and catch basin depth. Figure 1 presents a flow chart for determining the appropriate sampling device. Detailed descriptions of each sampling method are presented in Section 4.3.

4.2.1 Decontamination of Equipment

Non-disposable equipment that contacts solids samples should be thoroughly cleaned and decontaminated before each set of samples is collected. Decontamination should be done in accordance with City of Portland SOP 7.01a¹ or comparable standard. Decontamination solutions should be selected on the basis of the type of analysis being conducted on samples.

¹ Bureau of Environmental Services, Environmental Investigations Division, SOP No. 7.01a Draft or subsequent revisions, Decontamination of Sampling Equipment.

4.3 Sample Collection

This guidance for sampling catch basins is intended to assess individual catch basins as potential sources of past, present, or future conduits of contamination to Willamette River sediments. Sample collection should therefore incorporate material representative of the total depth and area unless specific alternative sampling objectives are otherwise noted and approved. In some cases, sample collection from discrete depths may be desired based on knowledge of catch basin maintenance and time since last cleaning, activities conducted within the drainage area, spills or releases, and related information.

Standing water in the catch basin, if present, may be pumped off to simplify sample collection. If this procedure is conducted, care must be taken to:

- Pump water from the surface only
- Leave a thin layer of water so that fine materials in the solids are not disturbed
- Pump water slowly so that fine materials are not disturbed
- Dispose of pumped water in the sanitary sewer (pumped water may not be released into the storm system)
 ↳ BATCH DISCHARGE Permit
- Document all steps taken, the depth and volume of water removed, the point of water disposal, water remaining before sampling, and other relevant factors

4.3.1 Sampling Firm Solids in Catch Basins Without Standing Water

Firm solids above the water line are most easily collected using simple soil sampling tools (that is, stainless steel spoon or trowel, or bucket auger). When sampling with a spoon or auger, solids may be moist or wet but should retain their form and structure when handled. (Note: If the sample has a high water content [water drips from solids], another sampling method should be considered to minimize the loss of fine particles in liquid drainage.)

4.3.1.1 Stainless Steel Spoon, Scoop, or Trowel

If necessary, the spoon, scoop, or trowel may be attached to an extension pole in order to reach the bottom of the catch basin, provided a representative sample can be retained on the spoon and recovered intact.

The following procedure defines steps to be taken when sampling dry or moist solids with a stainless steel spoon, scoop, or trowel:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Using a decontaminated stainless steel spoon, scoop, or trowel, collect an equal amount of material from five locations: each corner (or, if round, each compass point) and the center. Material recovered at each point should be a composite of the total depth of accumulated material, unless otherwise specified in the sampling plan.

5. Place sampled solids into a decontaminated stainless steel bowl or tray. Repeat step 4 as necessary in order to obtain the required volume, and mix to homogenize thoroughly using a decontaminated or disposable stainless steel spoon.
6. Collect a suitable portion of the mixed solids with a decontaminated or disposable stainless steel spoon and place into each appropriate sample container.
7. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
8. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.
9. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
10. Complete the chain-of-custody documents.

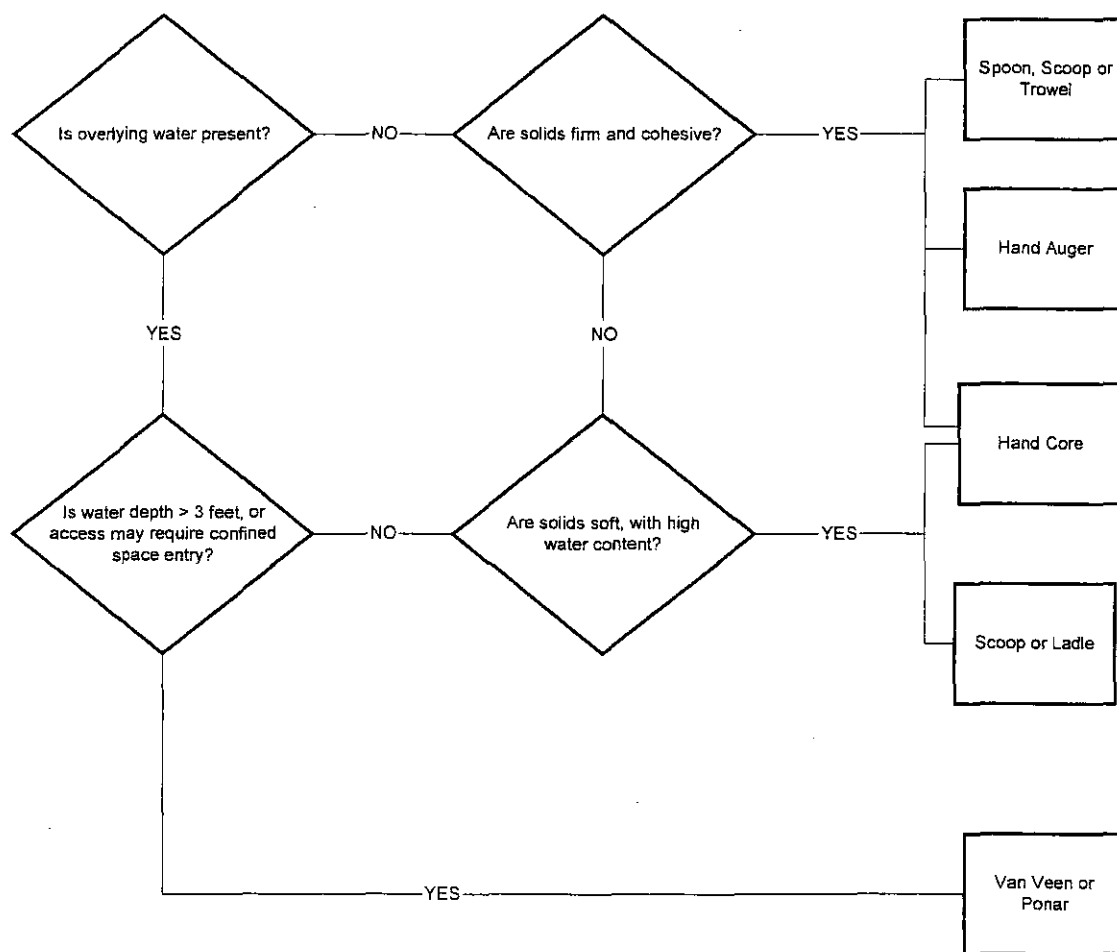
4.3.1.2 Stainless Steel Bucket Auger (Hand Auger)

Bucket augers are applicable to the same situations and materials as the spoon, scoop, and trowel method described above. Most bucket augers have long handles (> 4 feet), and some can be fitted with extension handles that will allow the collection of solids from deeper catch basins.

The following procedure defines steps to be taken when sampling dry or moist solids with a stainless steel bucket auger:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Advance a thoroughly cleaned and decontaminated bucket auger into catch basin solids in each corner (or, if round, each compass point) and the center of the catch basin. Material recovered at each point should be a composite of the total depth of accumulated material, unless otherwise specified in the sampling plan.
5. Empty the auger into a stainless steel bowl or tray. Repeat step 4 as necessary in order to obtain the required volume and mix to homogenize thoroughly, using a decontaminated or disposable stainless steel spoon.
6. Collect a suitable portion of the mixed solids with a decontaminated or disposable stainless steel spoon and place the sample into each appropriate sample container.

Figure 1. Flow Chart for Selecting the Appropriate Catch Basin Solids Sampler



7. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
8. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.
9. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
10. Complete the chain-of-custody documents.

4.3.2 Sampling Solids in Catch Basins with Standing Water

Hand corers or dredge samplers should be used when standing water is present in catch basins to prevent washout of sample material when the sampler is retrieved through the water column. Corers may also be used for dry and moist solids. Some hand corers can be fitted with extension handles that will allow the collection of samples in deeper basins.

4.3.2.1 Hand Corers

The following procedure defines steps to be taken when sampling saturated solids with a stainless steel hand corer:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Using a thoroughly cleaned and decontaminated corer, advance the sampler into catch basin solids with a smooth, continuous motion, twist corer, and then withdraw it in a single motion.
5. Remove the nosepiece and withdraw the sample into a stainless steel bowl or tray.
6. Repeat steps 4 and 5 in each corner (or, if round, each compass point) and the center of the catch basin. Material recovered at each point should be a composite of the total depth of accumulated material, unless otherwise specified in the sampling plan.
7. Mix to homogenize thoroughly, using a decontaminated or disposable stainless steel spoon.
8. Collect a suitable portion of the mixed solids with the decontaminated or disposable stainless steel spoon and place into each appropriate sample container.
9. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
10. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.

11. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
12. Complete the chain-of-custody documents.

4.3.2.2 Clamshell-Type Dredge Samplers

Clamshell-type dredge samplers like the Petite Ponar® and Van Veen® 0.025-m² dredge sampler are capable of sampling moist and wet solids, including those below standing water. However, penetration depths usually will not exceed several inches, so it may not be possible to collect a representative sample if the solids layer is greater than several inches. The sampling action of these devices causes agitation currents that may temporarily resuspend some settled solids. This disturbance can be minimized by lowering the sampler slowly and by allowing slow contact with the solids.

Samples collected with clamshell-type dredge samplers should meet the following acceptability criteria in order to ensure that representative samples have been collected (EPA, 2001):

- Solids do not extrude from the upper surface of the sampler.
- Overlying water is present in the sampler (indicating minimal leakage).
- Overlying water is clear and not excessively turbid.
- Desired depth of penetration has been achieved.
- The solids-water interface is intact and relatively flat, with no sign of channeling or sample washout.
- There is no evidence of sample loss.

The following procedure defines steps to be taken when sampling moist, wet, or submerged solids with a dredge sampler:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Using a thoroughly cleaned and decontaminated dredge-type sampler and working on a clean, decontaminated surface, arrange the sampler in the open position, setting the trip bar so that the sampler remains open when lifted from the top.
5. Slowly lower the sampler to a point just above the solids surface.
6. Drop the sampler sharply into the solids, then pull sharply on the line, thus releasing the trip bar and closing the dredge.
7. Raise the sampler and place on a clean surface. Slowly decant or siphon any free liquid through the top of the sampler. Take care to ensure that fines are not lost in the process; if necessary, allow the sampler to sit and the fine particles to settle before decanting or siphoning free liquid.

8. Open the dredge and transfer the solids into a large stainless steel bowl or tray of sufficient size to receive three sample loads.
9. Repeat steps 4 through 8 in diagonal corners (or, if round, two opposite compass points) and the center of the catch basin. Material recovered at each point should be representative of the total depth of solids in the sampling device. If necessary, modify sampling points to correspond to catch basin size or dimensions. Record any deviations in the field notes.
10. Mix to homogenize thoroughly, using a decontaminated or disposable stainless steel spoon.
11. Collect a suitable portion of the mixed solids with a decontaminated or disposable stainless steel spoon and place into each appropriate sample container.
12. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
13. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.
14. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
15. Complete the chain-of-custody documents.

5.0 Sample Acceptability

Only solids that are collected correctly with grab or core sampling devices should be used for subsequent physicochemical testing. Acceptability of grabs can be ascertained by noting that the samplers are closed when retrieved, are relatively full of solids (but not overfilled), and do not appear to have lost surficial fines. Core samples are acceptable if the core was inserted vertically in the solids and an adequate depth was sampled without significant loss out the mouth of the corer.

6.0 Quality Assurance and Quality Control

A rinsate sample may be appropriate or required when non-disposable sampling equipment is used. The equipment rinsate should be collected between sampling locations and after the device has been decontaminated. The rinsate sample should be analyzed for the same parameters analyzed for in solids.

7.0 Resources

1. ASTM. September 1994. Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediment for Toxicological Testing. American Society for Testing and Materials (E 1391-94). West Conshohocken, Pennsylvania.

2. EPA. 1987. A Compendium of Superfund Field Operations Methods, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response (EPA/540/P-87/001), Washington, D.C.
3. EPA. 2001. Methods for Collection, Storage, and Manipulation of Sediment for Chemical and Toxicological Analyses: Technical Manual. U.S. Environmental Protection Agency, Office of Water (EPA-823-B-01-002). Washington, D.C. October 2001.

APPENDIX B

Quality Assurance Project Plan Requirements

Table B-1 Laboratory Sample Preparation and Analytical Method Requirements

Table B-2 Laboratory Quality Control Requirements by Method

Table B-3 Laboratory Measurement Performance Criteria

Table B-4 Storm Water Discharge Monitoring Parameters Sample Reporting
Requirements for Water

Table B-5 Storm Water Discharge Monitoring Parameters Sample Reporting
Requirements for Solids

TABLE B-1
Laboratory Sample Preparation and Analytical Method Requirements
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Analyte	Method Reference	Preparatory Method	Cleanup Method	Instrument/Detector
Metals by ICP-AES	EPA 6010B	EPA 3005/3010/3050B	Not Applicable	ICP-AES
Mercury by CVAAS	EPA 7470/7471A	EPA 7470/7471A	Not Applicable	CVAAS
PAHs and Phthalates	EPA 8270C SIM	Solid: EPA 3540/3545/3550 Aqueous: EPA 3510/3520	EPA 3640/3650/3660	GC/MSD
PCBs	EPA 8082	Solid: EPA 3540/3545/3550 Aqueous: EPA 3510/3520	EPA 3620/3640/ 3660/3665	GC/ECD
TPH-DRO	NWTPH-Dx	Solid: NWTPH-Dx Aqueous: NWTPH-Dx	Not Applicable	GC/FID
TSS	EPA 160.2	NA	NA	NA
TOC/DOC	EPA 415.1	NA	NA	NA
PSD	PLM/SEM	NA	NA	NA

Notes:

EPA	Environmental Protection Agency
ICP-AES	Inductively coupled plasma-atomic emission spectrometry
CVAAS	Cold vapor atomic absorption spectrometry
DRO	Diesel-Range Organics
GC/FID	Gas chromatograph/flame ionization detector
PCBs	Polychlorinated biphenyls
GC/ECD	Gas chromatograph/electron capture detector
PAHs	Polynuclear aromatic hydrocarbons
GC/MSD	Gas chromatograph/mass spectrometric detector
TSS	Total suspended solids
TOC	Total Organic Carbon
DOC	Dissolved Organic Carbon
PSD	Particle size distribution
NA	Not applicable
PLM/SEM	Polarized light microscopy/scanning electron microscopy
SIM	Selective ion monitoring
TPH	Total petroleum hydrocarbons

TABLE B-2
Laboratory Quality Control Requirements by Method
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Analytes	Instrument	Initial Calibration	Initial Calibration Verification	Continuing Calibration Standard	Method Blank ^a	LCS ^a (Blank Spike)	Surrogate	MS/MSD ^{a,b}
Metals ^c	ICP-AES	Instrument-specific	1/curve	Every 10 samples	1/batch	1/batch	NA	1/batch
Mercury ^c	CVAAS	Instrument-specific	1/curve	Every 10 samples	1/batch	1/batch	NA	1/batch
DRO	GC/FID	5-point	1/curve	Every 10 samples	1/batch	1/batch	All Samples	1/batch
PCBs	GC/ECD	5-point	1/curve	Every 10 samples	1/batch	1/batch	All Samples	1/batch
PAHs and Phthalates	GC/MSD	5-point	1/curve	Every 12 hours	1/batch	1/batch	All Samples	1/batch

Notes:

^a Batch is equivalent to 20, or fewer, samples prepared together with common QC samples.

^b LCS/LCSD are substituted when there is insufficient sample for MS/MSD.

^c Metals and mercury analyses require laboratory duplicates.

ICP-AES Inductively coupled plasma-atomic emission spectrometry
CVAAS Cold vapor atomic absorption spectrometry
DRO Diesel-range organics
GC/FID Gas chromatograph/flare ionization detector
PCBs Polychlorinated biphenyls
GC/ECD Gas chromatograph/electron capture detector
PAHs Polynuclear aromatic hydrocarbons
GC/MSD Gas chromatograph/mass spectrometric detector
MS/MSD Matrix spike/matrix spike duplicate
LCS/LSCD Lab control sample/lab control sample duplicate
NA Not applicable

TABLE B-3
Laboratory Measurement Performance Criteria
GE Energy
Inspection and Repair Service Center
Portland, Oregon

QC Element	DQI Goal
Field QC Samples	
Interlaboratory Split Sample	40% RPD (Aqueous samples) 50% RPD (Solid samples)
Laboratory Quality Control Samples	
Initial Calibration	Instrument-specific (Metals and Mercury) < 20% RSD (Average response factors, NWTPH-Dx and EPA 8082) $R^2 > 0.99$ (Linear or nonlinear calibration, NWTPH-Dx and EPA 8082) < 15% RSD (EPA 8270C SIM)
Initial Calibration Verification	90% - 110% (metals and mercury)
Continuing Calibration Standards	90% - 110% (Metals and Mercury) 85% - 115% (NWTPH-Dx and EPA 8082, unless method-specified) 80% - 120% (EPA 8270C SIM)
Method Blanks	No analyte detections > MRL
Laboratory Control Samples (LCS)	80% - 120% (Metals and mercury) 70% - 130% (NWTPH-Dx, EPA 8082, EPA 8270C SIM)
LCS/LCS RPD	< 20%
Surrogate Recoveries	70% - 130% (Method blanks and LCS/LCSD) 60% - 140% (Field samples)
Matrix Spikes (MS)	75% - 125% (Metals and mercury) 60% - 140% (NWTPH-Dx, EPA 8082, EPA 8270C SIM)
MS/MSD RPD	< 40%
Laboratory Duplicates	< 30% for analyte concentrations > 5 x MRL ± MRL for analyte concentrations < 5 x MRL

Notes:

EPA	Environmental Protection Agency
RPD	Relative Percent Difference
QC	Quality Control
MRL	Method Reporting Limit
GC	Gas Chromatograms
SIM	Selective Ion Monitoring
TPH	Total Petroleum Hydrocarbons
RSD	Relative Standard Deviation
MSD	Matix Spike Duplicate

TABLE B-4
Storm Water Discharge Monitoring Parameters Sample Reporting Requirements for Water
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Method	Constituent	Laboratory Limits for Storm Water		Total Storm Water Screening Level Values ¹				Notes on Sample Reporting Requirements
		MDL	MRL	Human Health Fish Consumption ²	Human Health Ingestion ³	Ecological ⁴	Oak Ridge National Laboratory's (Tier II SCV)	
	Units	ug/L		ug/L	ug/L	ug/L	ug/L	
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270C-SIM (Laboratory limits based on 1000 ml sample.)	Naphthalene	0.039	0.12	-	0.2	620	12	
	2-Methylnaphthalene	0.043	0.13	-	0.2	2.1	2.1	
	Acenaphthylene	0.033	0.10	-	0.2	-	-	
	Acenaphthene	0.034	0.10	990	0.2	520	-	
	Fluorene	0.029	0.09	5,300	0.2	3.9	3.9	
	Phenanthrene	0.040	0.12	-	0.2	-	-	
	Anthracene	0.029	0.09	40,000	0.2	0.73	0.73	
	Fluoranthene	0.040	0.12	140	0.2	-	-	
	Pyrene	0.039	0.12	4,000	0.2	-	-	
	Benzo(a)anthracene	0.031	0.09	0.018	0.092	0.027	0.027	Human Health Fish Consumption, Ecological, and Oak Ridge National Laboratory's (Tier II SCV) screening values not achievable
	Chrysene	0.042	0.12	0.018	0.2	-	-	
	Benzo(b)fluoranthene	0.034	0.10	0.018	0.092	-	-	
	Benzo(k)fluoranthene	0.045	0.14	0.018	0.2	-	-	
	Benzo(a)pyrene	0.037	0.11	0.018	0.0092	0.014	0.014	
	Indeno(1,2,3-cd)pyrene	0.059	0.18	0.018	0.092	-	-	Analyte must be reported to method detection limit
Dibenz(a,h)anthracene	0.035	0.10	0.018	0.0092	-	-	Analyte must be reported to method detection limit	
Benzo(g,h,i)perylene	0.030	0.09	-	0.2	-	-		
Polychlorinated Biphenyl (PCB) as Aroclors by EPA 8082 (Laboratory limits based on 1000 ml sample.)	Aroclor 1016	0.0094	0.025	-	0.96	-	-	
	Aroclor 1221	0.0077	0.025	-	-	0.28	0.28	
	Aroclor 1232	0.0085	0.025	-	-	0.58	0.58	
	Aroclor 1242	0.011	0.025	-	-	0.053	0.053	
	Aroclor 1248	0.0081	0.025	-	-	0.081	0.081	
	Aroclor 1254	0.01	0.025	-	0.034	0.033	0.033	
	Aroclor 1260	0.0067	0.025	-	-	94	94	
	Total PCBs	0.01	0.025	0.000064	0.034	0.14	0.14	
Metals by EPA 6020, 6020B or 7470A/7471A (Laboratory limits based on 100 ml sample.)	Aluminum	3.66	20	-	(50-200)	87	-	
	Antimony	5.15	20	640	6	30	30	Analyte must be reported to method detection limit
	Arsenic	3.16	20	0.14	0.045	150	3.1	
	Cadmium	0.35	2	5	5	0.094	-	
	Chromium, total	0.85	5	-	100	-	-	
	Copper	1.17	5	-	1,300	2.7	-	
	Lead	4.43	10	-	15	0.54	-	
	Manganese	0.36	2	100	50	120	120	
	Mercury	0.025	0.05	0.146	2	0.77	1.3	
	Nickel	0.85	5	4,600	730	16	-	
	Selenium	6.38	30	4,200	50	5	-	
	Silver	0.79	5	-	100	0.36	0.36	
Zinc	0.35	2	26,000	5,000	36	-		
Total Suspended Solids by EPA 160.2 (Laboratory limits based on 1000 ml sample.)	Total Suspended Solids	1,000	4,000	NA	NA	NA	NA	
Total Organic Carbon by EPA 415.1 (Laboratory limits based on 1000 ml sample.)	Total Organic Carbon	250	1,000	NA	NA	NA	NA	
Dissolved Organic Carbon by EPA 415.1 (Laboratory limits based on 1000 ml sample.)	Dissolved Organic Carbon	250	1,000	NA	NA	NA	NA	

Notes:
NA = Not Available
EPA = Environmental Protection Agency
DEQ = Department of Environmental Quality
ug/L = micrograms per liter

TABLE B-5
Storm Water Discharge Monitoring Parameters Sample Reporting Requirements for Solids
GE Energy
Inspection and Repair Service Center
Portland, Oregon

Method	Constituent	Standard Laboratory Limits for Filtrate Sample	Laboratory Limits for Higher Sample Mass Filtrate Sample	Screening Levels		Notes on Sample Reporting Requirements
		MDL	MRL (Estimated)	MacDonald PECs and other SQVs	DEQ 2001 Bioaccumulative Sediment SLVs	
				Toxicity	Bioaccumulation	
	Units	ug/kg	ppb	ug/kg		
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270M-SIM (Standard Limits based on 1 milligram sample.)	Naphthalene	20	330	561	NA	
	2-Methylnaphthalene	25.3	330	200	NA	Analyte must be reported to laboratory method detection limit
	Acenaphthylene	25.2	330	200	NA	Analyte must be reported to laboratory method detection limit
	Acenaphthene	14.1	330	300	NA	Analyte must be reported to laboratory method detection limit
	Fluorene	2,000	100	536	NA	Analyte must be reported to laboratory method reporting limit
	Phenanthrene	14.50	330	1,170	NA	
	Anthracene	17.00	330	845	NA	
	Fluoranthene	17.60	330	2,230	NA	
	Pyrene	12.10	330	1,520	NA	
	Benzo(a)anthracene	20.10	330	1,050	NA	
	Chrysene	22.10	330	1,290	NA	
	Benzo(b)fluoranthene	26.70	330	NA	NA	
	Benzo(k)fluoranthene	9.40	330	13,000	NA	
	Benzo(a)pyrene	17.30	330	1,450	NA	
	Indeno(1,2,3-cd)pyrene	16.10	330	100	NA	Analyte must be reported to laboratory method detection limit
	Dibenz(a,h)anthracene	26.40	330	1,300	NA	
	Benzo(g,h,i)perylene	18.70	330	300	NA	Analyte must be reported to laboratory method detection limit
Phthalates by EPA 8270 SIM	Di-n-butylphthalate	73.2	220	100	-	Analyte must be reported to laboratory method detection limit
	Bis(2-ethylhexyl)phthalate	23.9	72	800	330	
	Di-n-octyl phthalate	12.6	38	-	-	
	Dimethyl Phthalate	16.2	48	-	-	
	Diethylphthalate	17.4	52	400	-	
	Butylbenzylphthalate	28.7	86	-	-	
Polychlorinated Biphenyl (PCB) by EPA 8082 (Standard Limits based on 1 milligram sample.)	Aroclor 1016	0.346	1,730	530	420	
	Aroclor 1221	0.915	4,575	NA	NA	
	Aroclor 1232	0.624	3,120	NA	NA	
	Aroclor 1242	0.452	2,260	NA	2	
	Aroclor 1248	0.712	3,558	1,500	4	
	Aroclor 1254	0.374	1,872	300	10	
	Aroclor 1260	0.383	1,915	200	NA	
Metals by EPA 6020, 6020B or 7470A/7471A	Aluminum (pH 6.5-9.0)	3,660	20,000	-	-	
	Antimony	5,150	20,000	64,000	10,000	Analyte must be reported to laboratory method detection limit
	Arsenic	3,160	20,000	33,000	-	
	Cadmium	350	2,000	4,980	3	Bioaccumulation screening value not achievable
	Chromium, total	850	5,000	111,000	4,200,000	
	Copper	1,170	5,000	149,000	10,000	
	Lead	4,430	10,000	128,000	128,000	
	Manganese	360	2,000	1,100,000	-	
	Mercury	200	200	1,060	-	
	Nickel	850	5,000	48,600	316,000	
	Selenium	6,380	30,000	5,000	100	Toxicity and Bioaccumulation screening values not achievable
	Silver	790	5,000	5,000	-	
	Zinc	350	2,000	459,000	3,000	
Total Petroleum Hydrocarbons by NWTPH-Dx (Standard Limits based on 1 milligram sample.)	Diesel Range Organics	25,000	1250	NA	NA	

NA = Not Available
EPA = Environmental Protection Agency
ug/kg = micrograms per kilogram
DEQ = Department of Environmental Quality
ug/L = micrograms per liter
*Minimum sample size of 3 grams for PAHs and 1 gram for PCB required for analytical analysis
ppb = parts per billion